THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXIII. No. 831.] LONDON, APRIL 15, 1879. [31ST YEAR.] Price 6d.

**GAS PURIFICATION**
BY
**OXIDE OF IRON.**

**COOKE BROS.,**
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

**GENUINE TORBAY PAINT**
**And SPECIAL GASOMETER PAINT.**
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
**TORBAY PAINT COMPANY.**
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WORKS: BRIXHAM, TORBAY.

**THOMAS PROUD,**
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
**LAYING MAINS**
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
**WOOD GRIDS**
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
**JOSEPH COWEN and CO.,**
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and everything else in Fire-Clay, are promptly executed at their Works above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

**JOHN RUSSELL & CO.,**
LIMITED,
*Established at the commencement of Gas Lighting,*
MANUFACTURERS OF
TUBES AND FITTINGS.
**THREE PRIZE MEDALS,**
**Paris, 1878.**
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OLD PATENT TUBE-WORKS, WEDNESBURY.

**JOHN BENT & SON,**
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

**THOMAS PIGGOTT & CO.,**
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
*Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.*
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
*Roofs, Girders, and Bridges, and General Smith's Work.*
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
**"OTTO" GAS-ENGINE.**
See Page 546.
CROSSLEY BROTHERS,
**MANCHESTER AND LONDON.**

THE
**NITSHILL COMPANY'S**
DUKE OF HAMILTON'S
**LESMAHAGOW**
**CANNEL COAL.**
AGENT:
**JAMES M'KELVIE,**
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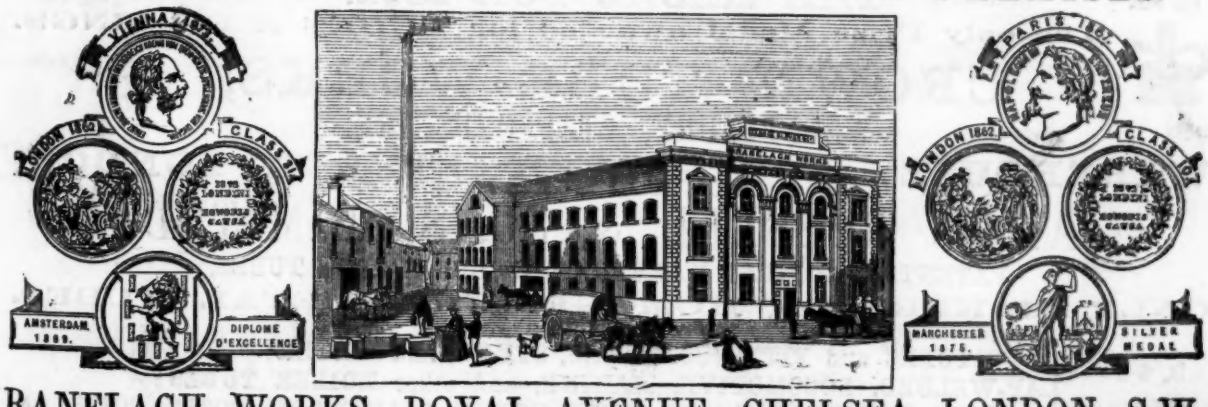
**CHANGE OF ADDRESS.**

# GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
**HAVE REMOVED TO MORE EXTENSIVE PREMISES:**




RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

# LLOYD AND LLOYD,

**ALBION TUBE-WORKS, BIRMINGHAM,**

AND

**COOMBS WOOD TUBE-WORKS, HALESOWEN,**

MANUFACTURERS OF

**WROUGHT-IRON TUBES AND FITTINGS,**

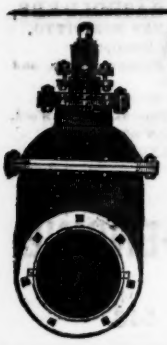
AND

**LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,**

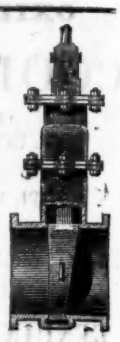
UP TO FOUR FEET IN DIAMETER.

**London Offices: No. 4, Cloak Lane, Queen Street, E.C.**

**Warehouses: London, Liverpool, Manchester, and Lille.**



## C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

**DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.**

# EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

# FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

# ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

**ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.**

MANUFACTURERS OF EVERY DESCRIPTION OF

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CONTRACTORS FOR THE

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Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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The only Prize Medal awarded for TUBES & FITTINGS.

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MANUFACTURERS OF

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**LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;**

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**GAS-FITTERS TOOLS, VALVES, COCKS, &c.**

# THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

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**PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;**

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AND GAS APPARATUS OF EVERY DESCRIPTION.

**SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,**

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

**ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.**

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

# DANIEL HOWARD,

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GASHOLDER AND BOILER WORKS,

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MANUFACTURER OF

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**WROUGHT AND CAST-IRON TANKS FOR DITTO.**

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

**WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.**

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

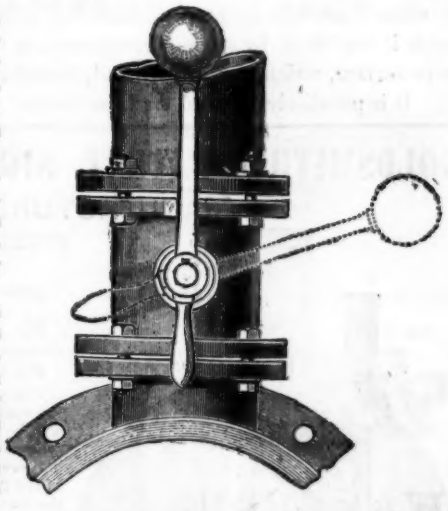
AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

## COLSON'S PATENT ASCENSION-PIPE THROTTLE-VALVE.

THIS Valve is designed to supersede the hydraulic seal, and is intended to be placed immediately in or on the retort mouthpiece, or at such a distance therefrom as to be within reach of the workman. By the use of these Valves, the whole of the pressure is removed from the retorts, and a largely increased make of gas per ton obtained; the deposit of carbon is very slight, choked ascension-pipes are unknown, and the quality of the coke is improved.

When the retort is being drawn or charged, the lever, which is attached to a Spindle and Throttle-Valve, is thrown over as shown by the dotted lines, thereby closing the ascension-pipe; but when the retort is sealed, the lever is placed in a vertical position, and a free way made for the gas to pass to the relieving main.



The Valves (upwards of two hundred in number) supplied to the Gas Committee of the Corporation of Birmingham, for their Windsor Street Works, continue to give complete satisfaction, and no difficulty has been experienced in working retorts fitted with them in combination with others worked in the usual way with the hydraulic seal.

The following important testimonial has been received:—

*Corporation of Birmingham Gas Department, Windsor Street Works, Feb. 17, 1878.*

MESSRS. STANFORD AND BEESLEY.

DEAR SIRS,—In reply to your inquiry, I beg to say that the Valves (Colson's Patent) supplied by you in July last have given entire satisfaction. The retorts fitted with them are worked side by side with others having the ordinary dip-pipe, without any difficulty being experienced.

Yours truly, (Signed) CHARLES HUNT.

*For further Particulars, apply to*

**Messrs. STANFORD and BEESLEY,**

**General Engineers and Sole Makers of COLSON'S PATENT ASCENSION-PIPE THROTTLE-VALVE,**

**89, DARTMOUTH STREET, BIRMINGHAM.**

# GAS PURIFICATION
BY
## OXIDE OF IRON.
## GAS PURIFICATION & CHEMICAL Co., LIMITED,
**PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.**

JOHN WM. O'NEILL, Managing Director.

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## SAMUEL CUTLER & SONS,
**CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF**
**GASHOLDERS, TANKS, PURIFIERS,**
**SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.**

S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.
They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.
SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

**Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.**

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

**For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to**
**S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.**

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1862.

## HALLETT'S
## PATENT ANTIMONY PAINT.
MADE ONLY BY
## GEORGE HALLETT & CO.,
## 296, ROTHERHITHE, LONDON, S.E.

CLASS II.

**Price 30s. per Cwt. Special Driers supplied at same Price.**

This light stone-coloured Paint, for which a Prize Medal was obtained in 1862, is free from certain defects of white lead. It does not produce any deleterious effect upon the health of those who use it, such as painter's colic, nor is it blackened by sulphur compounds in the atmosphere; while, from its less specific gravity and good body, it covers more surface, weight for weight, and, therefore, it is preferable and more economical than white lead.

It is peculiarly adapted for Gas-Works.

---

## GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.
**MANUFACTURED BY GUEST AND CHRIMES,**
**FOUNDRY AND GENERAL BRASS WORKS,**
**ROTHERHAM;**
**AND 85, SOUTHWARK ST., LONDON, S.E.**

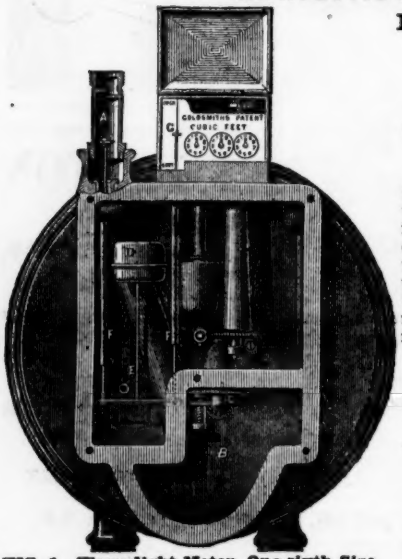


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

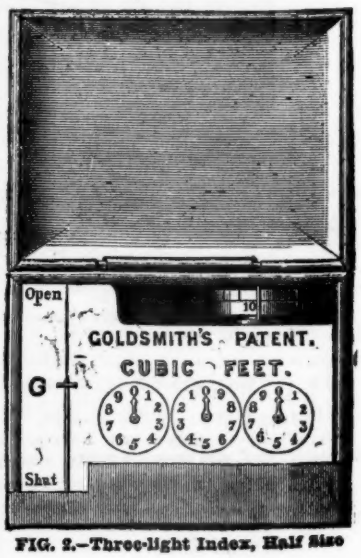


FIG. 2.—Three-light Index, Half Size

## GEORGE ORME & CO.,

**ATLAS METER-WORKS, OLDHAM,**

MANUFACTURERS OF

**WET AND DRY GAS-METERS,**

**STATION-METERS, GOVERNORS,**

**PRESSURE AND EXHAUST REGISTERS,**

LAMP-METERS IN CAST-IRON BOXES,

**And every Description of Gas Apparatus.**

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## JAMES MILNE & SON,

**GAS ENGINEERS,**

**Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,**

EDINBURGH, AND

**2, KING EDWARD STREET,**

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

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## J. & J. BRADDOCK,

GAS ENGINEERS,

**GLOBE METER-WORKS, OLDHAM,**

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

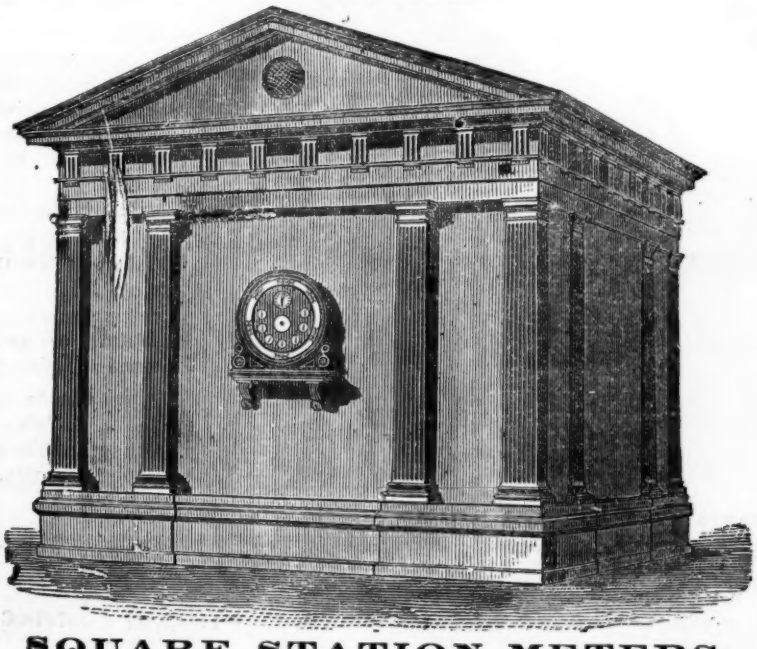
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

**ROUND STATION-METERS,**

ON CAST-IRON STANDS.



**SQUARE STATION-METERS,**

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

*Orders almost invariably despatched on the day of receipt.*

TERMS, &c. ON APPLICATION.

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## C. & W. WALKER'S

**WOOD PURIFIER SIEVES,**

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

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ESTABLISHED IN 1830.

**BENJAMIN CARPENTER,**

THE ORIGINAL MANUFACTURER OF THE IMPROVED

**WOOD SIEVES**

FOR

**GAS PURIFIERS & SCRUBBERS.**

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LONDON, N.

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**MOBBERLEY & PERRY,**

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAY.

Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE,

BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

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**JOHN ROMANS, C.E., F.G.S.E.,**

CONSULTING GAS ENGINEER

AND

**CANNEL COAL FACTOR,**

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

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**GRIRDROD'S PATENT**

**PORTABLE PIPE SCREWING**

**MACHINE,**

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

**W. H. BAILEY & CO.,**

Brassfounders, Gauge Injector and Tool Makers,

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LANCASHIRE.

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**Gold Medal Awarded, Paris Exhibition, 1878.**

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**SHEAF AND SPRING WORKS,**

**SHEFFIELD,**

MANUFACTURERS OF

**FILES OF BEST QUALITY**

**FOR ENGINEERS,**

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY.

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# R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

## BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners.

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

## TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

## GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

## METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

## GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

R. W. W. & CO.

LONDON OFFICES & SHOW-ROOMS: 141, FLEET STREET, E.C.

# AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

PALMER & SON.

Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

## THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR HOISTING, PRINTING, & PUMPING.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

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## CROSSLEY BROTHERS,

MANCHESTER.

LONDON HOUSE: 116, Queen Victoria St., E.C.

# TANGYE BROTHERS AND HOLMAN,

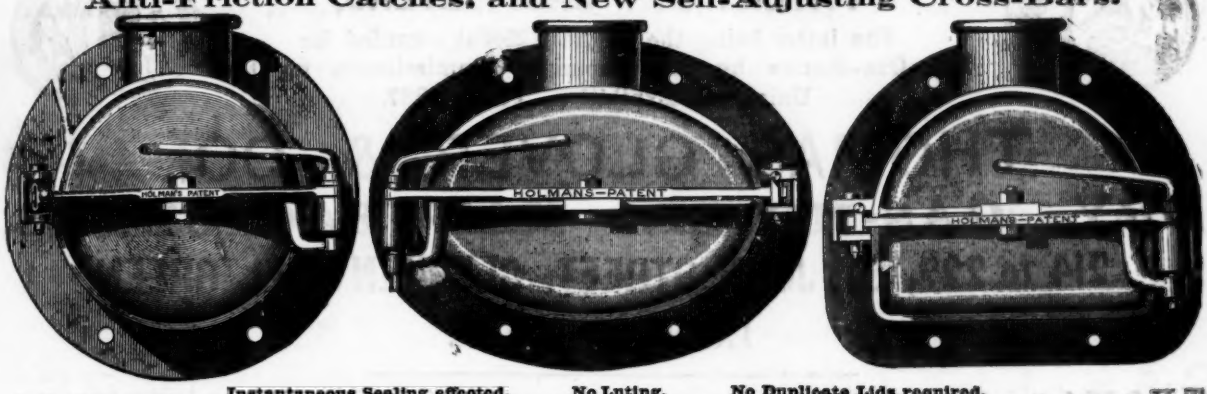
**CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,**

(LATE OF 10, LAURENCE POUNTNEY LANE.)

## SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

**WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,**

**Anti-Friction Catches, and New Self-Adjusting Cross-Bars.**




**Instantaneous Sealing effected. No Luting. No Duplicate Lids required.**

**Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.**

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

**T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.**

**D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—**

**The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.**
**And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland**

## HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (2), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

### TESTIMONIAL.

*The Gaslight and Coke Company,*
*9, Water Street, New Bridge Street,*
*Blackfriars, E.C., Feb. 27, 1878.*

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

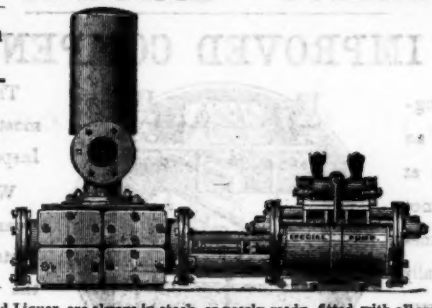
Yours truly,

(Signed) JOHN JOHNSON.

**PRICES AND FULL PARTICULARS ON APPLICATION.**

## THE "SPECIAL" STEAM-PUMP.

| Diameter of Steam Cylinder. | Diameter of Water Cylinder. | Length of Stroke. | Gallons of Water per Hour, Approximate. | Reduced Prices. |
|---|---|---|---|---|
| 3 | 1½ | 9 | 450 | £16 |
| 4 | 2 | 9 | 815 | 18 |
| 5* | 2½ | 12 | 1,250* | 20 |
| 5* | 3 | 12 | 1,830* | 22 10 |
| 4 | 4 | 12 | 3,250 | 25 |
| 6* | 4 | 12 | 3,250* | 30 |
| 5 | 5 | 12 | 5,070 | 32 10 |
| 7* | 5 | 12 | 5,070* | 40 |
| 6 | 6 | 12 | 7,330 | 40 |
| 8* | 6 | 12 | 7,330* | 50 |
| 7 | 7 | 12 | 9,750 | 50 |
| 10* | 7 | 12 | 9,750* | 65 |



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-pieces between steam and pump cylinder, at a small extra cost.

**TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.**

*FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.*

London, 1851. New York. 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

## PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

# THOMAS GLOVER & CO.,

## DRY GAS-METER MANUFACTURERS,

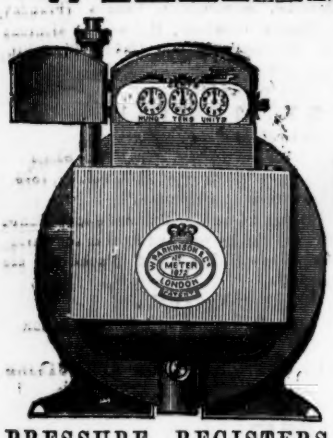
## 214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

## LONDON, E.C.

### THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

# WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

## WET & DRY METERS,

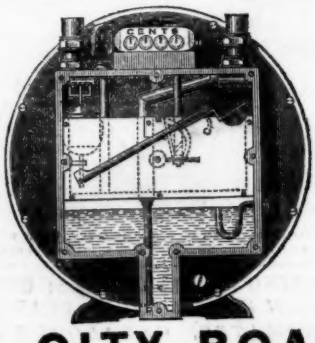
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

### HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

## COTTAGE LANE, CITY ROAD, LONDON, E.C.

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## TO CORRESPONDENTS.

A CONSTANT READER.—*Yes, he may, if not interested in any contract.*

*No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.*


# THE JOURNAL OF GAS LIGHTING,
## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, APRIL 15, 1879.*


## Circular to Gas Companies.

THE electric light can hardly be said to make much progress to an invention which will be generally useful. The correspondent of a morning contemporary, who recently interviewed Mr. Edison, describes an arrangement which is, no doubt, excessively ingenious. The novelty in it is the use of an alloy, probably of iridium and platinum, which, heated to vivid incandescence, is said to produce sufficient light to illuminate an apartment. Of course, we cannot dispute this; but having often brought platinum wire to an intensely white heat by means of electricity, we entertain no belief that any practical use could be made of the invention as it is described by our contemporary. The special contrivance by which it seems that Mr. Edison now proposes to generate and distribute the electric force is not distinctly revealed to us. We read that a six-horse power engine may be employed with a Gramme machine to evoke the force necessary to illuminate six, or it may be eleven of the mysterious alloy coils which show the light. The joke, so far as we can see it, is that while all his lights can be kept going at their full power, he can boast that the arrangements are so perfect, that the turning of a switch will extinguish all the lights except one, which can be brought down so as to be just sufficient to illuminate a sick-chamber. The idea that a six-horse power engine must be kept going to furnish light for a sick-chamber is too grotesque; but this is what the correspondent of our contemporary, who professes to have spent a night in Mr. Edison's workshops, asks us to believe. Very ingenious automatic contrivances have also been devised for controlling the electric force. We know pretty well what automatic contrivances usually come to. The light may or may not be effective, but of this we have no certain knowledge, and we shall wait with all patience for some intelligent statement in an American scientific journal. At the present time, the whole thing is in a fog, and intelligible particulars are much wanted. It may be that the inventions will soon be introduced to the British public, and when they are, we shall be very happy to see, and express a candid opinion respecting them. We know that at the present time they are laughed at in the States, notwithstanding the fact that Mr. Edison has unquestionably done some very wonderful work. But he has not yet abolished Gas Companies, and, to speak with the utmost candour, we doubt whether he ever will. His fellow-countrymen who are engaged in the gas trade have no fear of him, and, so far as we can gather any knowledge of his inventions, they look on them with less fear than on some others now before the public.

The meeting of the South Metropolitan Gaslight and Coke Company—a report of which is published in another column—brings us confirmation of the rumour that the above-named Company are about to amalgamate with the Surrey Consumers Gas Company. The union, we believe, may now be considered as an accomplished fact. Which of the two Companies benefit the more by the combination, may be guessed; but, after all, the position of the Surrey Consumers is not so bad as some people have asserted. We may congratulate both Companies on the turn affairs have taken. Union is said to be strength, and certainly will be found to be the case when these two important Gas Companies work together in a compact district.

The Tottenham and Edmonton Gas Company appear to have done extremely well during the past half year. There is nothing astonishing in this, for their district is an exceedingly good one, and business must necessarily increase. It is, however, only fair to say, that the Directors are doing their best to encourage consumption. Notably, it seems, they have taken the wise course of reducing the price to the public lamps, and have thereby put the parishes in good humour, and at the same time induced the erection of a large number of pillars and lamps. Perhaps, before very long, the Directors may find themselves justified in reducing the charge for gas to private consumers, some of whom, in the district, are charged too high. The works will presently require extension, for which purpose it will be necessary to make a call upon the Shareholders, who will be but too glad to pay. We need only add that full dividends were declared, as usual, on both classes of shares.

The Rio de Janeiro Gas Company, Limited, held their annual meeting on the 3rd inst., and, as usual, a dividend of ten per cent. was declared. We are happy to see that the relations of the Company with the Brazilian Government are assuming an aspect more favourable to the Company. There seems now to be a prospect that a further contract will be obtained, and that the property of the Company will not be confiscated. It would be disgraceful on the part of the Brazilian Government to act inimically to the Company, when they have conducted their business so fairly, and conferred so much benefit on the city. It seems, however, that the Company will not be so badly off, if the worst should come to the worst; for a capital expenditure of £750,000, there will, it seems, be, taking the valuation of the Brazilian Government, after deducting the dividend just declared, a sum in hand of £802,000; so that the Shareholders are safe for twenty shillings in the pound.

There are in the world some over-sensitive people. We will not say that a gentleman at Burnley, for whom we have much respect, is one of them; but we cannot help thinking that he has taken unnecessary offence at a few innocent observations we made in last week's "Circular." All our readers know that we prefer to see commercial undertakings in the hands of commercial bodies; but we think every one will admit that we never wittingly do a Local Authority an injustice. The paragraph respecting Burnley gas, last week, was based on a local report of the meeting of the Town Council. Complaints, as our correspondent must know, were made of the quality of the gas. We are now assured that these were unfounded, and that the illuminating power of the gas is excellent, and the purity beyond all doubt. We are glad to receive the assurance. Into the wider question, as to whether it is better for consumers, large or small, to have cheap gas and pay high rates, or *vice versâ*, we shall not enter this week. The simple line of argument we have always adopted is, that "every tub should stand on its own bottom." Regarding the manufacture of gas by a Local Authority as a co-operative business, we have in every case contended that the article should always be sold on the Scottish system—at cost price—and that rates should be levied in accordance with the necessity for them. We may congratulate the consumers of gas, as well as the ratepayers of Burnley, on the exertions which are being made to still further improve and cheapen the article.

We very much regret to see that the Middlesbrough Town Council have required their Gas Manager to resign his appointment, on account of what is known as the "gas-tank muddle." It is always considered somewhat of a slur upon a man to be compelled to resign a post of trust; but, in this instance, Mr. Booth's well-known character as a skilful and energetic Manager was immediately recognized by the Corporation of Southport, who selected him, out of 112 candidates, to be the Manager of the Gas-Works of that borough. We have no doubt the failure of the tank, and the mistake as regards the payment to the Contractor, have weighed heavily on his mind; but the action of the Gas Committee at Middlesbrough has relieved him of any pecuniary responsibility.

The Metropolitan Board of Works have just granted a licence for the storing of 250 gallons of petroleum in a mansion in Kensington Palace Gardens. It was not without opposition that the licence was granted, although it was stipulated that the most effectual precautions should be taken against a conflagration. The object of this large store of inflammable material is, of course, to revive one of the many inventions which have been devised to illuminate a large house by means of air impregnated with petroleum vapour. It is very well known that not one of these numerous arrangements has hitherto answered. The light is bad and dear, and the stench has been abominable. Every one is, of course, at liberty to adopt any process he likes for the illumination of his mansion; but that an American scientific man should, in these days, look to petroleum, and not to electricity, to light up his mansion, is very curious.

Experiments continue to be made with buoys constructed to hold compressed petroleum gas, and to afford continuously a light at entrances to harbours, and, in short, in all situations in which navigation is difficult. The system has been mentioned more than once in our columns, and would not again be referred to, but for the fact that we have an account before us of further experiments made by the Trinity Board, who have ordered the construction of additional buoys, to burn continuously for four to six months. There is no question about the ingenuity of the system by which this light is gained, but we should be very glad to see it on a foggy night, not to mention a foggy day, for it burns continuously. To have a light which shall burn without intermission day and night for twenty-eight days, is undoubtedly, in some respects, a benefit; but if the light be no better than that we see in the Metropolitan railway carriages, the distressed mariner, longing to find safe anchorage, is, we think, not likely to be guided by it to the desired spot. The proverbial starfish might be invoked to furnish an illumination quite equal.

The best days for photographers have passed, still a great deal is done in the way of portraiture; but gas has hitherto contributed very little to the progress of the art. This was, no doubt, owing to the absence of the powerful burners which are now coming into use. An enterprising photographer in Newcastle-upon-Tyne—Mr. P. M. Laws—has taken up the matter, and, with the aid of one of Mr. Wigham's powerful burners, and the use of reflectors, has produced portraits of much excellence. The actinic power of a gas-flame is much stronger than used to be imagined, and although the time of exposure necessary for a wet plate is longer than in diffuse daylight, it is now made clear that excellent portraits can be taken by gaslight. Any ladies or gentlemen who can keep their heads still for the space of four minutes can have an admirable portrait taken with the assistance of gas. The matter is of more scientific importance than anything else, but for interiors and monuments of which pictures are required, the employment of gas may shortly come into extensive use.

We regret to learn that the family of Mr. J. Johnson, the late Chief Inspector of The Gaslight and Coke Company, have, by his death, been left in very straitened circumstances. His colleagues in the office have generously come forward and subscribed over £250 to relieve the family from present difficulties, and it is hoped that other friends will assist in putting the widow and five children in a more comfortable position.

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COLNE AND MARSDEN LOCAL BOARD GAS SUPPLY.—At the monthly meeting of the Colne and Marsden Local Board, on Monday, the 17th ult., the Gas Committee reported that, on last year's accounts, a balance of £1538 11s. 8½d. remained for appropriation, and that it had been proposed in committee that the division of such balance should be as it then stood upon the balance-sheet—viz., £1045 19s. 1d. to go to the depreciation-fund, which is at the rate of 2½ per cent. upon the capital, and the remaining balance be carried to the account of the general district rate. An amendment, that a sum of £300 should be taken from such balance to the general district rate and the remainder to depreciation-fund, was carried. The Committee also resolved that from Jan. 1 the price for gas should be reduced at the rate of 5d. per 1000 feet consumed—the rates to be 3s. 1d., 3s. 4d., and 3s. 9d. per 1000, according to the amount of consumption, and that in future the Board adopt the system of requiring deposit, the latter not to exceed 10s. each. This only to apply to new occupiers of houses. The report was adopted.

## Water and Sanitary Notes.

IT is not at all surprising that supreme interest should be taken in the supply of water to our rural populations. People who are acquainted with the matter know perfectly that, whether the inhabitants of three or four cottages take their supply from a shallow well in their immediate neighbourhood, or walk a quarter of a mile to obtain water from a brook or other source, they fare equally well. No grosser humbug is at present attempted on the public mind than the endeavour to prejudice the deluded inhabitants of these islands against their water supply. Nevertheless, we admit that much might be done to improve it, but mainly in one direction. There is in every long hot summer a scarcity of water in the rural districts, mainly in the south and west, which produces moral, if not physical disorder. The villages fight for water, which perhaps ought to be supplied to them, for villages in these days want everything supplied to them. It is perfectly right that H.R.H. the Prince of Wales should suggest that every town and village in the country should have a supply of pure and wholesome water—and of beef and bread besides, which would better satisfy them. It is not always easy to get such supply, but, if it can be obtained, who is to pay for it? The amateur sanitarians who meet in the Adelphi know very little about the rates which are crushing down the industrial populations of our provinces, and would, for an amount of organic matter represented by a second decimal place per gallon, compel them to resort to distant and expensive supplies.

We have said above, that improvements in the water supply all over the country are necessary. But what can be said of sentences like the following, which appeared in a leader in *The Times* last week:—"In cities, privileges have been "granted to Water Companies without any due care that these "privileges should carry with them corresponding obligations, "and the resulting monopolies are little less oppressive than "some of those which excited popular discontent in the days of "the Tudors"? The remainder of the paragraph is simply a perversion of facts. The Metropolitan Water Companies are subjected to rigid supervision. That the inhabitants of the Metropolis have not a constant supply of water, is simply and solely due to the inaction of the Authorities, backed up by the meanness of the Ratepayers themselves. If they would put their fittings in order, they might have a constant supply of water in a few months, and, but for the expense it would bring on the Water Companies themselves, we would recommend them to turn on the taps and flood the people who now complain of insufficiency of supply.

Dr. Frankland reports a slight improvement in the condition of the Metropolitan Water Supply for the month of March. We take his reports for what they are worth, but we notice that, contemporaneously, the death-rate has been a little exaggerated. Everybody can, of course, give a satisfactory reason for this, without any reference to the water supply. A "wave of cold," as it was said in the Registrar-General's report, killed an unusual number of old people and children. The death-rate in the district of the Chelsea Water-Works Company was not, so far as we know, exaggerated, notwithstanding the fact that the day on which Dr. Frankland examined the water it contained "fungoid "growths and moving organisms."

The Nottingham Corporation have made another, and what they call a final offer, for the purchase of the Water Company's undertaking. It is that they will pay annuities of six and a half per cent. for the first year after the transfer, six and three-quarters per cent. for the second, and seven per cent. in perpetuity. All cash balances, after a sum of £20,000 has been set aside for the payment of compensations, &c., are to belong to the Corporation. These terms we cannot regard as satisfactory, and the struggle must go on. It is impossible to forecast the issue of a contest between the Company and the Corporation. We are prevented from quoting precedents; but we cannot help thinking that the Nottingham Company will come from a Committee with far better terms than their adversaries now offer them, and that, if arbitration be resorted to, better still.

The Bristol Water-Works Company pay, as usual, a full dividend of ten per cent., and in this instance add a bonus of one per cent. for arrears of dividend. The additional works of the Company are rapidly progressing towards completion, and soon the upper parts of Clifton will be effectually supplied with water. When this is done, all complaints, will doubtless cease, and the Company will have a long term of peaceful existence.

The circumstances of the Sheffield Water-Works Company are improving and they are able this year to pay a dividend of two per cent. Their works, extensive as they are, are in excellent order, and let us hope that in future years, not far distant, the Shareholders will reap the remuneration they so well deserve.

## THE REDUCED CHARGE FOR THE ELECTRIC LIGHT.

A FALL of fifty per cent. in the price charged for the electric light represents a bold attempt to command the market. We are not aware that any great discovery has been made whereby electricity can be obtained at a very much cheaper rate than was practicable six months ago, yet the Société Générale d'Electricité are reported to have made an offer to the City Commissioners of Sewers, a few days back, reducing the charge per lamp per hour from a rate exceeding tenpence to one as low as fivepence. One of the Commissioners thought the offer a very eligible one; but nobody else thought so, and the electric light has accordingly not been renewed on the Holborn Viaduct. The French Company had previously been more successful with the Metropolitan Board. New terms were offered to the latter body, whereby the Victoria Embankment was to be illuminated with the Jablochkoff light for three months, at a charge of fivepence per lamp per hour, this charge to include not only the price of candles, but also "all current charges." It was subsequently resolved that not only should the experiment be thus prolonged, but that twenty additional electric lights, on the Jablochkoff system, should be erected on the Embankment, so as to command the entire distance between Westminster and Blackfriars Bridges. As a spectacle, the effect will be a fine one, but the practical issue is one of cost. In order to maintain the twenty extra lights, the French Company will have to introduce another Gramme machine and its exciter, but the present steam-engine will suffice, though, of course, with a proportionate increase in the consumption of coal.

Doubtless, the French Company are quite at liberty to lower their price. But it would be more satisfactory if we knew what was the real cost of the light. Unless, as we have intimated, there has been some sudden discovery, placing at command a much cheaper mode of producing the electric light than any hitherto known, one of two things must be inferred—either that the Company charged too much before, or they are charging too little now. In the next place, supposing the present price to have a fair commercial basis, we have still an element of uncertainty, seeing that we do not exactly know what is the extent of the burden which will have to be borne by the Metropolitan Board. It is pretty certain the fivepence per hour will not include everything, even in the way of current expenses, apart from matters relative to capital. We are not asking that the special cost of Mr. Keates's experiment should be included in reckoning up the expense of the electric light; but, at the same time, it is requisite that everything essential to the production of the light should be represented in the account. The question at issue is a very important one, for we may rest assured, in the present state of the Money Market, that if there were a fair opening for investors in the formation of companies for working the electric light, there would be a rush in that direction. The fact that the public stand aloof from projects of this kind affords tolerable evidence that the prospect of a handsome profit on electric lighting is by no means clear.

Making use of such facts as come within our reach, it may be well to consider the economic aspect of the electric light as it now presents itself. That fivepence per lamp per hour will not cover everything, is evident. But, taking this price, we will proceed to compare it with the charge for gas—a commodity which is considered by some people to yield rather too large a profit. Measured by the standard of gas, we ought to have for fivepence as much light as that of 384 candles. This is on the supposition that we are burning sixteen-candle gas, with an apparatus capable of yielding the statutory lighting power, the price being 3s. 6d. per thousand feet. The burners devised by Mr. Sugg are capable of giving this proportion of light, if not more. The large burners at Waterloo Place, consuming cannel gas of twenty-candle quality, costing 4s. 4d. per thousand feet, give the light of 409 candles for fivepence, the total being 3680 candles for 3s. 9d. per hour. It might be fair to say that for the sum of fivepence, London gas, as applied to street illumination, will yield the light of 400 candles. In comparing this with the electric light, we must inquire what is the lighting power of one of the Jablochkoff lamps. We have lately estimated the light emitted by one of these lamps, when covered with the opalescent globe, at 250 candles, and we do not think this will be found to be under the mark. As, therefore, the cost of the Jablochkoff light unquestionably exceeds fivepence per lamp per hour, even at the present reduced rate, the difference is largely in favour of gas. A gentleman recently writing in *The Times* has made a very bold statement, to the effect that Waterloo Place "could be lighted by five small "Gramme machines at a less cost per hour than 3s. 6½d., "including all working expenses of the steam-engine, attend-"ance, carbons, &c., and the total amount of light would be "about six times greater than with the new gas arrangements." What "could" be done is, perhaps, doubtful; but the reader will see that what is actually being done differs enormously from the statement just quoted. Mr. M. Radcliffe Ward, who writes the letter to *The Times*, may have a very wonderful lamp to recommend, and unquestionably, if he can do what he talks about, he will eclipse both the Jablochkoff candle and gas itself. He has only to produce the results which he has promised, and he will speedily find patrons. As the case now stands, we see that gas will give the light of eighty candles for an hour at the cost of a penny, while, under like conditions, the Jablochkoff lamp will only give the light of fifty candles.

The advocates of the electric light will perhaps say that we are dealing unfairly by the Jablochkoff lamp, in not estimating the absolute power of the light, independently of the opalescent globe. But we answer that the light which is intercepted is lost, and as the opalescent globe appears to be a necessity, we cannot take account of that which is thus destroyed. It may happen that, by some modification of the present globe, a better result will be obtained. But we see that the effective light must be brought up to 400 candles for the fivepence, in order to establish an equality with gas, and this fivepence must cover everything, except a small amount corresponding to the cost of lighting, cleaning, and repairing the gas-lamps. To get the light of 400 candles by the Jablochkoff system, the quantity intercepted must be reduced to thirty-six per cent., instead of being, as now, sixty per cent. The aid of reflectors, we may observe, does not affect this part of the question, as gas may be assisted in the same manner.

It may appear to some of our readers that if the economic margin between gas and the electric light is no more than the difference between eighty and fifty candles, or between an interception of sixty per cent. and thirty-six per cent., the contest is becoming rather close. But we would call attention to two points—first, that the charge of fivepence does not really cover all charges; and, secondly, that nothing appears to show a sufficient warrant for the large reduction in price which has just taken place. All we have heard of in the shape of cheapening the light consists in a reduction of about a penny in the cost of the "candle," which would represent a saving of something like that amount in the course of an hour. An improvement has also been effected, whereby a Jablochkoff candle is re-lit on the restoration of the current after the light has been extinguished. This is the more important, seeing that the extinction of one Jablochkoff candle in a circuit is the extinction of all. Formerly the candles that went out by any accident were rendered practically useless. This now can be avoided, simply by adopting a modified form of the insulating material. But it will be seen that the saving represented by these two items can only justify a slight reduction. In the trial of the Jablochkoff light at Westgate-on-Sea, the carbons cost eightpence per hour for each lamp. The price now, if the experiments were carried out in the same way as before, would be at least sixpence. We are, therefore, at a loss to understand how the French Company can afford to supply the lights on the Victoria Embankment at fivepence per hour per lamp, "including all current charges." In respect to lighting power, the photometric observations at Westgate showed that the average amount of light emitted by each covered lamp was rather under than over two hundred candles, thus showing that our estimate of 250 candles is likely to be in excess of the fact. The power of the uncovered light could not be ascertained at Westgate, owing to the interference of the wind, which agitated the light. But the effect of the opalescent globe is pretty well known, and, taking the interception at sixty per cent., we get a total of no more than five hundred candles on the basis of the Westgate experiment. If the interception be less than sixty per cent., the result is so much the worse for the light in respect to its absolute power.

The report of the City Engineer on the lighting of the Holborn Viaduct, despite the defects of that document—for which defects it would be unfair to hold Colonel Haywood personally responsible—may perhaps be taken as showing us pretty clearly what is the cost of the Jablochkoff light. Taking the data thus furnished, we can scarcely put the cost of the light at less than a shilling per hour per lamp, if we are to include everything. In the Westgate experiments, the working expenses amounted to seventeen pence per lamp per hour. The result there, as worked out by Messrs. Bennett and Valon, was ludicrous, the cost of the equivalent of London gas being simply equal to that of the fuel, oil, and water consumed in the production of the Jablochkoff light. Messrs. Bennett and Valon, in their reckoning, do not give the London gas the full benefit of its statutory lighting power, yet they show that on the mere basis of the working expenses, the cost of the Jablochkoff system, reckoning light for light, is five times that of gas. Esti-

mating the cost for a year, including all charges, both for capital and working expenses, the figures work out more economically; but still the cost of the electric light, without allowing full power for the gas, is nearly four times as much as the equivalent of light from gas at London price. The cost of the Jablochkoff light is thus reduced to a little under fifteen pence per lamp per hour. How the fivepence is to be maintained in the face of these figures we cannot understand, even allowing that only the current expenses are provided for, and that a portion of the expenditure is defrayed from another source.

The probability that any system of electric lighting cheaper than the Jablochkoff candle will be brought before the public, is difficult to estimate. We cannot say what may be the future achievements of science; but a system of electric lighting may be very much cheaper than the Jablochkoff method, and yet be very much dearer than gas. Even if lamps of 2000 candle power are made to yield their light at a price which competes with gas, such lamps will not be admissible into ordinary apartments. There are many serious difficulties surrounding the problem of domestic lighting by electricity. It may be said of the electric light, that physically it defies storeage, and economically it defies distribution. It is apparently intended and designed to occupy a place peculiar to itself, stepping in to do some kind of work to which gas is unequal, while at the same time gas fulfils a function wholly out of the range of the electric light. Mr. Edison, it is true, takes a different view of the situation, and we are now told that "the wonderful lamp" which is to go forth from Menlo Park, has grown more wonderful still during the delay which has withheld it from the world. It is stated that Mr. Edison has discovered a new alloy, having a fusing point much higher than either platinum or iridium, and at the same time so cheap as to rescue the electric light from the reproach of costliness. This alloy is declared to possess "properties heretofore "unknown, or at least undefined by scientific men." Its virtue is such that, while it reduces the cost of the electric light, it "has "increased the illuminating power to such a degree that six "lights are now obtained per horse power where only four were "possible with the pure platinum coil." We thought Mr. Edison had long ago accomplished six lights per horse power, and a great deal more. However, he is now looking forward to a result which will give him eleven lights per horse-power; but this is only "hoped for" when "a new generator" has been constructed. A good deal is said about the readiness with which the new light can be controlled, so as to shine with the lustre of a "glowing meteor or the subdued radiance of a night-lamp for "a sick-room." Whether the current is economized as the light is reduced, is, perhaps, a doubtful point. We are told that "the "light can be made bright or dim by increasing the resistance of "the electric switch." This luminous statement probably refers to an operation which ought to be designated "varying the "resistance;" but, of course, so grand an invention is superior to mere precision of language.

Some particulars are given as to the plan on which the new light is to be supplied to private houses, and many persons will perhaps be rather captivated with the idea that they are to be at liberty to keep the electric lamp alight all night and all day, from year's end to year's end, without extra charge. But this announcement points to the fact that the current must continue to flow, in some direction or other, whether it is utilized or not, otherwise it will not be ready when wanted. Also it is apparent that the full force of the current has to be continuously exercised, whether or not the full power of the light is required. In short, the maximum expenditure has to be maintained, even though the lights may fall to a minimum. We confess there is no obvious difficulty in varying the current within certain limits, and assuredly the demand in the day ought to be consistent with a great reduction in electric power. The price to be charged for the supply of the electric current is to be at the rate of one dollar (four shillings) per year for each burner, such burner giving the light of eighteen candles. Supposing it requisite to keep the light going day and night all the year round, the electric light would thus be at least forty times cheaper than London gas, and very much cheaper still in comparison with American gas! At this rate we may expect light to become a drug in the market. Compared with gas, consumed in the ordinary way, it is calculated that the Edison light will be at least twelve times cheaper than the gas of New York. The interviewer who tells this marvellous tale, with all the advantage of the largest type in the columns of the *Daily News* (wherein he is cautiously styled "A," not "Our" Correspondent), discreetly says, in reference to the dollar per year, "It is more than "likely that this figure is too low." How much too low, of course, remains to be seen; and it is to be observed that these extraordinary statements, as to the cost and manner of the supply, depend upon on the authority of Mr. Batchelor, Mr. Edison's chief assistant, rather than on the authority of Mr. Edison himself. But we are finally assured that the price of the electric light "will certainly be one-third or one-fourth the cost "of gas, after the system is perfected." As the comparison is made with American gas, it does not show such a very crushing cheapness, compared with the London gas supply; and, after all, we have to wait until "the system is perfected." Can Mr. Edison gave us the date?

## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

### CLXXV.

### THE TREATMENT OF RESIDUAL PRODUCTS.

#### NITROBENZENE (*continued*).

The process of Messrs. Perkin for preparing nitrobenzene consisted in using for the nitrification of the benzene nitrate of soda and sulphuric acid, instead of nitric acid or a mixture of the latter with sulphuric acid. The process requires the nicest care, and, even after great experience on the part of the operator, there is always danger of explosion. As this method of preparing nitrobenzene is now abandoned, there will be no necessity for giving a detailed description of it.

#### ANILINE ($C_6 H_7 N$).

This alkaloid, which is now the pivot upon which a colossal industry turns, was discovered in the year 1826 by Unverdorben, while investigating the products of the destructive distillation of indigo. He noticed its property of forming readily crystallizable salts, and, on that account, gave it the name of crystalline. It has at different periods received the names of Kyanol, Benzidam, Amido-benzene, and Phenylamine.

Shortly after its discovery by Unverdorben, Runge, in the course of his memorable researches on coal tar, separated from that substance a basic body possessing the characteristic property of yielding a blue coloration with a solution of chloride of lime, and, not knowing that it was identical with Unverdorben's crystalline, gave it the name of Kyanol.

Subsequently Fritzsche, while examining the products of the distillation of indigo with potash, observed the principal portion of the distillate to consist of a basic oil, to which he gave the name of aniline, from *anil*, the Portuguese name for the indigo plant. About the same time Zinin discovered the important fact that an alcoholic solution of nitrobenzene, by treatment with sulphide of ammonium, yielded a volatile oily alkaloid, to which he gave the name of Benzidam.

The relation of the substances known under the above names to each other was not understood until Hofmann undertook a comparison of the supposed different alkaloids from all the above sources, and demonstrated their identity. It is, in fact, to Hofmann that chemistry is indebted for first throwing a clear light upon the constitution and metamorphoses of aniline. His researches were not only of the most laborious and searching character, but the brilliant results they afforded gave an insight into the nature of organic alkaloids generally which has been of incalculable service, not only to science, but also to industry.

Aniline is now prepared on a large scale exclusively from nitrobenzene, and almost always by the process of M. Béchamp (Compt. Rend. de l'Acad., xxxix. 26) which yields it more readily and economically than any other. Indeed, it is not too much to say that the commercial production of aniline colours would never have arrived at its present magnitude but for this discovery of M. Béchamp. The process consists in reducing nitrobenzene by ferrous acetate. The nature of the reaction will be evident from the annexed equation—

$$\underbrace{C_6H_5NO_2}_{\text{Nitrobenzene.}} + 6\,FeO + H_2O = \underbrace{C_6H_7N}_{\text{Aniline.}} + 3\,Fe_2O_3.$$

The acetic acid does not enter into the decomposition, and is, therefore, omitted from the equation.

On the large scale, the nitrobenzene, prepared and washed as previously described, is decomposed in vertical or horizontal cast-iron cylinders. The Messrs. Perkin, who were the first to manufacture aniline on the large scale, employed cast-iron cylinders of the form represented in fig. 15. The cylinder, *a*, had an axis, *c c*, passing through it, carrying the agitators, *b b*. As originally made, the latter was turned by manual labour; but it is now invariably done by steam power. The horizontal axis or shaft passed through a stuffing-box

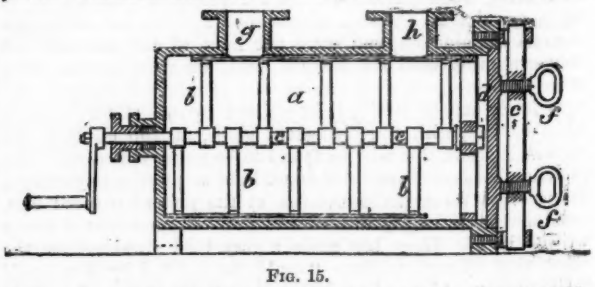


FIG. 15.

at the end, near the handle by which it was rotated. The moveable cast-iron cover, *d*, was kept in its place by the bar, *e*, through which passed the pressure screws, *f f*. The opening, *g*, served to enable the

materials for the reaction to be introduced, and the tubulature, *h*, enabled the distilled product to be conducted to the apparatus for condensation. In the earlier days of the aniline manufacture, Messrs. Perkin employed Woulfe's bottles of stoneware for that purpose; but cast-iron worms are now almost invariably used. The flange of the cylinder against which the cover presses was covered with a coarse kind of putty. The cylinder was set in brickwork, and the operation conducted by fire. The flues were so arranged that the flame was prevented from playing directly on the cylinder, as in that case it would soon have become permanently injured. An arch of bricks (or a large cast-iron or fire-clay plate) was, therefore, interposed between the cylinder and the fire-place. By some mistake, this apparatus is described by MM. Girard and De Laire as that used by Messrs. Perkin for the manufacture of nitrobenzene by means of nitrate of soda and sulphuric acid.

The apparatus for the conversion of nitrobenzene into aniline may be made in a great variety of forms. The operation is so simple and so easily conducted that no manufacturer will find any difficulty in devising an arrangement for the purpose; that described by MM. Girard and De Laire for effecting the conversion of nitrobenzole into aniline may be considered as illustrating all that can be required in such an apparatus.

The cast-iron cylinder, *a a'*, in fig. 16, is made in two parts; they are joined together by flanges and screws, as shown in the engraving. The agitator, *b b*, can be rotated by the hollow shaft, *c*, which allows steam to enter the apparatus through the holes, *e e*, in the agitator. The pipe, *j*, supplies steam from the boiler, which enters the hollow shaft of the agitator at *d*, the supply being regulated by a screw-valve, *k*. Two man-holes are represented at *f f*; the lower one serves to enable the residue of the operation to be

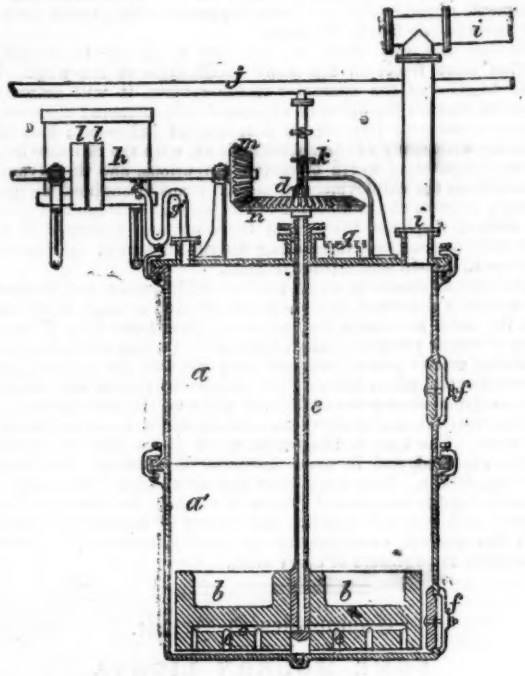


Fig. 16.

removed. The opening, *g*, enables the iron borings to be introduced. The nitrobenzene and acetic acid are introduced into the apparatus from the reservoir, *h*, by the syphon or S-shaped tube, *g'*. The aniline and the other products of the reaction escape by the tubes, *i i*, and thence proceed to the condensing worm. The rotation of the agitator is effected by means of the pulleys, *l l*, and the bevel wheels, *m n*.

Although the apparatus described is typical in its completeness, it is certain that any intelligent engineer could construct an arrangement equally perfect in action, but much less costly. The separation of the cylinder into two portions is not essential, and there is an element of weakness in having the rotating shaft, *c*, constructed hollow. The steam can easily be introduced in a simpler and cheaper manner; in fact, a still for the reduction of nitrobenzene can readily be constructed from any cast-iron pot having a broad flange round its upper edge. The size of the apparatus must be regulated by the quantity of nitrobenzene which it is desired to convert at each operation.

The method of carrying out the reduction is susceptible of considerable variation. Supposing that 500 lbs. of nitrobenzene are to be reduced, we may commence by running in through the syphon, *g'*, 40 lbs. of acetic acid of a specific gravity of 1·06, diluted with five or six times its weight of water; in subsequent operations the acid distillate from a previous operation may be substituted. The rotation of the agitator is now to be commenced, and 1 cwt. of cast-iron borings, finely ground, may be inserted at the tubulature, *g*. The nitrobenzene should now be run in, and the reaction at once commences. More iron is then to be gradually added, until it amounts to about 700 lbs. When the distillation has become rapid, from the heat of the reaction, the condensed liquid is to be received from the worm in stoneware jugs, and returned to the still from time to time until the nitrobenzene is found to have been almost entirely reduced. In order to ascertain this, the oily portion of the distillate may be dissolved in hydrochloric acid in a graduated tube, which is then to be filled up with water, and, after shaking, allowed to repose. Two or three tubes may be employed, so as to enable the later testings to be compared with the earlier ones. When the operation is considered to be finished, steam is to be admitted by the screw-tap, *k*, and the products of the reaction distilled over.

The reaction must not be allowed to become too violent, as, in that case, the reduction of the nitrobenzene may proceed too far, and benzene be reproduced. According to Berthelot, even the aniline first formed may be reduced into benzene and ammonia.

The aqueous distillate contains acetic acid and acetone* as well as the aniline; and, as we have said, if the reduction has been too energetic, more or less traces of benzene.

The writer prefers to have the means of heating the aniline stills by fire as well as steam, in order to diminish to some extent the water in the distillate.

On the addition of caustic soda to the crude distillate, the acid present is neutralized, and the aniline separates. To remove the aqueous portions, the whole may be introduced into iron cylinders, having one or two taps at different heights. By this means the watery fluid may be run off, and the aniline received in a state fit for rectification.

The residue remaining in the apparatus consists principally of ferric hydrate, which, the writer is informed, has been experimented upon on a considerable scale in Germany and France for the purification of gas. It is said, however, not to revive so readily as the ordinary oxide in general use.

The rectification of aniline is a matter of great importance, as its value for certain operations depends entirely on its boiling point. It must be remembered that commercial anilines are divided into two principal classes—"aniline for blue," which is, or should be, pure aniline; and "aniline for red," so called, but which consists chiefly of a mixture of the ortho, para, and meta toluidines.

Anilines may be rectified in various ways. MM. Girard and De Laire, *loc. cit.*, p. 341, describe an elaborate apparatus for the purpose, which is said to work well on the large scale. As a description of it would be too long for the present article, the reader is referred to the original work. It will be evident that the nature of the aniline will depend upon the quality of the *benzole* or *benzene* used in the preparation of the nitro compound.

When commercial anilines are rectified over the naked fire in ordinary cast-iron stills, it is advisable not to push the distillation to dryness, as, in that case, the still soon becomes injured. The portions left behind contain xylidine, cumidine, azobenzene, acetanilide, phenylene-diamine, tolylene-diamine, paraniline, xenylamine, and, probably, several other substances. As, however, they are not of immediate importance, they will not be further referred to in this sketch of the aniline manufacture.

Aniline for Blue should, as we have said, be as pure as possible. It may be obtained by repeated rectification of ordinary light anilines, or, preferably, by working in the first place on a benzene of the highest class. By the latter is understood one that has been purified by careful rectification, followed, if possible, by freezing.

It is not difficult now to find commercial aniline for blue distilling entirely between one or two degrees, or even less, as with the specimen described below.

The following determination of boiling points was made upon an aniline supplied by a well-known French firm. The experiment was made in an ordinary retort, according to the method described in the article on boiling points at p. 511 of this Journal. The thermometer, T, was in the vapour, and a cardboard screen was used to prevent heating of the second thermometer, *t*, by the hot air arising from the lamp. The readings were taken when 10, 25, and 90 per cent. of the fluid had distilled over:—

| | T. | *t*. | N. | Temperature corrected. |
|---|---|---|---|---|
| 10 per cent., at | 179·5° .. | 18·75° .. | 108° .. | 182·18° C. |
| 25 „ „ | 180·0° .. | 21·75° .. | „ .. | 182·64° „ |
| 90 „ „ | 180·0° .. | 25·50° .. | „ .. | 182·57° „ |

MM. Girard and De Laire give 180° to 185° as the boiling point (uncorrected?) of a high-class aniline, prepared from crystallized benzene boiling between 83° and 84°. It will be seen that, if uncorrected, the boiling points of the aniline given above would have appeared to be two and a half degrees below that of a pure substance; but, as corrected, the results are exceedingly satisfactory.

Pure aniline is a colourless, oily liquid, having a somewhat vinous odour. However colourless it may be when first distilled, it soon becomes brown on keeping. Its specific gravity at 16° C. = 60·8° Fahr. is, according to Hofmann, 1·020. Its boiling point, according to the same authority, is 182° C. = 359·6° Fahr. It solidifies at —8° C. Its vapour density, as determined by Barral, was found to be 3·219; theory requires 3·234. It is decidedly poisonous. Workmen exposed to its vapour for some time have symptoms much resembling those produced by nitrobenzene; and the treatment recommended at p. 474 of this volume for poisoning by that substance may also be used where the symptoms have been caused by aniline. Workmen should not be permitted to enter stills or storing-tanks which have contained aniline, until they have been thoroughly cleansed. Care should also be taken that the men who attend aniline stills should not be allowed to inhale its vapour more than can possibly be avoided. The stills should be placed in sheds open at one side, or in thoroughly

* "On Béchamp's Process for Preparing Aniline." By Mr. Greville Williams. *Chem. News*, Oct. 27, 1860.

well-ventilated rooms; and the water in the condensers should not be allowed to get too hot. The workmen should also be warned against allowing their hands and clothes to become wetted with the aniline, in pouring it from one vessel to another. With common care, no danger whatever need be incurred; and, during more than 20 years experience, the writer has never seen a fatal case of poisoning by this substance.

Aniline dissolves to a small extent in water, but separates on the addition of an alkali or common salt. It also takes up a small quantity of water, the amount varying with the temperature. When subjected to distillation on the large scale, a certain amount of water always comes over at the commencement.

Aniline may be detected, even in very small quantities, by the violet colour which is produced on adding a few drops of a solution of chloride of lime to its aqueous solution. It colours deal wood a bright yellow. This reaction is very delicate, but not characteristic, as, unfortunately, several other bases do the same. A solution of hydrochlorate of aniline washed over a well-planed deal board, yields a beautiful, and, as far as the writer's experience has gone, permanent yellow stain. If a trace of an alkaline nitrite be placed on a fragment of solid hydrochlorate of aniline, it rapidly communicates to it a brilliant crimson colour. So delicate is this reaction, that it is almost impossible to prepare colourless hydrochlorate of aniline near a place where alkaline nitrites are manufactured.

According to an observation of the writer, made many years ago, aniline at the boiling heat dissolves indigo, and deposits it, on cooling, in brilliant copper-coloured spangles. (*Chem. News*, April 27, 1861.) A description of the methods of converting aniline into colouring matters being foreign to the objects of this sketch, the reader desirous of further information is referred to works professedly dealing with that subject. The treatise of MM. Girard and De Laire, and Watts's "Chemical Dictionary," may be consulted with advantage; the latter, and its Supplements, contain a great number of references to the papers of English and Continental writers on aniline and its almost innumerable derivatives.

## TWO RECENT WORKS ON THE STEAM-ENGINE.

Of books treating on mechanical subjects, perhaps more have been written on the steam-engine than on all the other cognate branches put together. The theme is an inexhaustible one, and since the days of Watt the theory and practice of the construction and working of the steam-engine have engaged the attention of the best scientific minds in this and other countries. The results of the lucubrations of the different writers are, however, of strangely unequal merit, the most practical amongst them failing to convey the knowledge they undoubtedly possessed in an attractive and readable or even intelligible form. Messrs. Crosby Lockwood and Co. have just issued a second edition of Mr. Goodeve's "Text-book on the Steam-Engine;"* and the fact that a reprint of the work has been called for within so short a period of its first publication, is a strong testimonial in its favour. The author modestly states that the book does not profess to be an exhaustive treatise on the theory and practice of the steam-engine, but as preparing the way for a complete and extended study of the subject. We venture to assert, however, that the student who will make himself master of the information conveyed in the work under consideration will possess more than a mere rudimentary knowledge of the principles enunciated. The author's style is condensed and to the point, and he never obtrudes himself before his readers, but, like a skilful teacher, keeps the subject well in front, and, as though handling a well-finished model, rivets the mind of the student by drawing attention to its various distinctive features.

Beginning with a sketch of the steam-engine as it existed in the time of Watt, together with a review of the ideas then prevalent as to the nature of heat, and a summary of some of the physical properties of steam, Mr. Goodeve proceeds to investigate the principles of the modern theory of heat in its application to the steam-engine. The conversion of motion is then dealt with, and the salient points in the mechanism of an engine explained. The expansion of steam, the action of valves, and the application of Watt's indicator, occupy an interesting and valuable chapter, followed by one treating on boilers and the consumption of fuel. Compound cylinder engines of various types, both land and marine, are next discussed at length, and the advantage that arises from the application of the principle of compounding is clearly set forth. The last chapter deals with various miscellaneous details, as the Giffard's injector, the governor, and the link motion; and the work concludes with a series of useful examination questions to enable the student, by writing out the answers at length, to test the thoroughness of his reading and study.

After a careful perusal of the work, we can speak of it in terms of high commendation. In these days, when much has to be read, it is refreshing to meet with a book which, like that under review, does not contain a superfluous word. The text of the author is illustrated with 143 fairly-executed woodcuts, and a frontispiece showing the Glasgow model of Newcomen's steam-engine.

The other work,† to which we can only briefly direct attention, is of much larger bulk, and deals more with the practice than the theory of the construction of prime movers. Its author, Mr. Bourne, also treats the subject in a more personal manner, as it is naturally impossible that he should ignore his own individual work of improvement and invention, in which he has had no inconsiderable share during an active life. In regard to this matter he remarks: "If I were to suppress all reference to what I have myself done or proposed in connection with the improvement of thermo-dynamic engines, my historical narrative would necessarily be very imperfect, and we should be deprived of those indications, afforded by the movements of the past, of the probable eventualities of the future. Nor do I know how I could better communicate for the benefit of others the results of my own experience and reflections than by narrating what I know of the flow of events and the tendencies of opinion in connection with steam-engine improvement during the period in which I have given my attention to that subject. While, therefore, it is both necessary and fitting that I should notice my own projects and predictions in common with those of others, I am perfectly sensible of the prejudice such a course is almost sure to create; and in accepting the dilemma, I wish to bespeak the indulgence proper to be given where the fault is the result of an extraneous necessity, and not the result of any innate appetite for vain-glory. In speaking of my own contributions to the general stock of engineering intelligence or achievement, I shall endeavour to be as concise and modest as I can, and when I may seem to be otherwise, I trust that the offence will be imputed rather to the exigencies of the exposition than to any desire on my part to be raised to an unmerited exaltation" (pp. 4, 5). We could the more readily have excused the author's frequent references to his own suggestions and achievements had there been an effort on his part, in the present work, to condense the matter of the text within more readable compass. This might have been done with marked advantage to the book. Its value as a work of art would have been enhanced by the operation, whilst its general usefulness would have remained unimpaired. The extract given above is an example of the prolixity of style frequently indulged in by the author. The same sentiments might easily have been expressed with greater force and directness in one-fourth the space.

Having said this much, we are now at liberty to express our opinion more freely on the many excellencies of the work. In a large treatise of the character under review, it will scarcely be expected that all the opinions expressed will command the assent of readers capable of forming an independent judgment; but, whilst differing with many of the author's views, with the estimate he puts on the comparative worth of certain inventions, and the advantages arising from the employment of special forms of engines, we unhesitatingly express our admiration of the wide knowledge and grasp of the subject displayed throughout the work, and commend it to all interested in practical engineering for the amount of information it conveys in a lucid and attractive form.

The various classes of steam-engines, mill, marine, and locomotive, are lengthily described, and their growth and gradual development, and the most noticeable improvements that have been effected in them of recent years critically examined. Various other projects for obtaining motive power, amongst them air and gas engines, occupy a considerable place, whilst their respective merits are compared. The construction of boilers of all the different classes—Cornish, Lancashire, vertical, and other types—constitutes a valuable portion of the work. The text is illustrated by 54 plates and 356 woodcuts, clearly executed, and in many instances they exhibit the minutest working details. In a voluminous appendix, much information of a valuable kind is compressed. Taken as a whole, the work is a library in itself, and the vast quantity and variety of material it embodies, with the general excellence of its quality, renders it a desirable acquisition to engineers of every class.

* "A Text-book on the Steam-Engine." By T. M. Goodeve, M.A. Second edition. London: Crosby Lockwood and Co.

† "Examples of Steam, Air, and Gas Engines." By John Bourne, C.E. London: Longmans, Green, and Co.

# Communicated Article.

## SOME MODERN LIGHTS.

By "Isca."

It is more than probable that a simple observer who might chance to look over a few recent numbers of almost any scientific journal, would become possessed with the notion that the world is, somehow or other, oppressed with great darkness, and that the need of some contrivance for the purpose of material enlightenment is most pressing.

Fortunately, the importance of any system or order of things is not to be measured by the amount of noise that can be made about it; and although the partisans of gas lighting, to say nothing of the upholders of oils and candles, may not sound the loud timbrel quite so persistently as their would-be rivals, they, at all events, rejoice in the consolation of the fact that the public generally still depend on their wares as of old, and that, as far as they are able to judge, the said public are, with the usual amount of chronic grumbling, tolerably well satisfied with the provision already available for lighting streets and apartments.

For some inexplicable reason, to supersede gas appears to be the one motive paramount in the minds of the advocates of novel systems of artificial lighting. Why gas should be so superseded is not so clear, especially in view of the fact that it exists in the friendliest rivalry with all kinds of other luminants; yet the desire to turn out gas, and dismiss the companies who manufacture it, with all their shareholders and dependents, "bag and baggage," seems to be the ruling idea of every one who has discovered, or thinks that he has discovered, a means of lighting, which, if at all successful, would probably be adopted for its intrinsic qualities, whatever they might be. But as there are no duplicates in nature or art, and every known substance used in manufactures or science has some special field of applicability, for which it is peculiarly fitted, and for which no substitute can be found, it is perfectly safe to suppose that gas would be no exception to the general rule, but that there would still be room

and to spare for all improved methods of lighting, without necessarily "superseding" anything now extant.

These reflections are suggested by some remarks of Dr. Morton, who, at a time when the scientific world and, for the matter of that, unscientific people as well, were much exercised in mind about the Edison light, boldly imagined the dawn of an era when even that nascent prodigy would be demolished by the adoption of some chemical preparation for coating walls, whereby they might exhibit the phenomenon of fluorescence to such a degree as to literally turn night into day, by storing up the light of the sun to which they would be exposed during the day, and giving it out when darkness gathered, or at least would gather in places where night would not have been disestablished by the expected magic light-wash.

This supposition had for its rather slender foundation the fact that clocks, fitted with dials which possess the faculty of self-luminosity in the dark, have been recently introduced. These dials are coated with a compound endowed with the remarkable property of fluorescence in an eminent degree, by virtue of which they show a ghostly glimmer, something like that of the moon in a fog, when placed in darkness after their surface has been excited by exposure to light. But the absolute amount of light exhibited by them under these conditions is scarcely such as to warrant the expectation that from such a source is to proceed the luminant which is to administer the "happy despatch" to gas, or, in fact, to shake the superiority of a lucifer match, when a man wants to see the time in the dark. Nevertheless, the self-luminous character of these dials is sufficiently remarkable to give interest to a brief examination of the means whereby that property exists.

Various substances have been observed to possess the power of being visible in darkness after exposure to light, without any apparent combustion (such as in the case of phosphorus) to account for the phenomenon, the real cause of which is still matter for conjecture, but is probably to be found in molecular action of a different kind to that which is accompanied by new arrangements of matter.

The particular compound with which these dials are coated is stated by Dr. Morton to be sulphide of calcium (CaS), a substance which is well known to gas managers in an impure form in lime purifiers, and which may be obtained by heating pure lime with sulphur. Another account states that sulphide of barium (BaS) is the compound used. This is prepared from the sulphate of barium by grinding the latter to a fine powder, mixing it with an equal weight of flour, and making into a paste with oil. The mixture is then to be placed in a crucible with a little charcoal, covered with a luted lid, and made white hot for an hour, then allowed to cool. The sulphide is to be dusted over a surface waxed to receive it. Sulphide of strontium is also fluorescent, but either calcic sulphide or baric sulphide gives the most marked effect. Different colours may be produced in the emitted light by employing calcium in different proportions or different forms, such as Iceland spar, aragonite, &c.

It is evident that there is a great deal in this field of experimental chemistry which remains to reward patient investigation. A practical application has at length been found for what has hitherto been looked upon as a mere curiosity, although known and experimented upon for over a century; but, from the very nature of things, any such property of matter is far from the probability of such infinite development as would be necessary to enable it to take its place as a means of rendering anything besides itself visible in darkness. It would, however, be interesting to conduct a series of careful experiments with some of the above-mentioned substances, with a view to measuring the durability of their luminosity after definite periods of exposure to a known power of light. Some of these clock-dials have been known to retain sufficient light to be visible in a very dark room after having been secluded from light for a week. This is a curious and important matter, and should certainly be inquired into; because, if the energy which is expended during a whole week could be given off in two or three hours, the difference would be something similar to that observed when an iron wire is rusted by a damp atmosphere, instead of being consumed in pure oxygen gas.

In another and better known sphere of inventive activity, that of light produced by magnetism or electricity, the *reductio ad absurdum* would appear to have been reached by one of the latest American devices. It is in the form of an electric lamp, complete with battery, coils, and Geissler tube, of a size suitable for carrying in the waistcoat pocket, and its use is intended to be that of enabling the time to be read from a watch-dial, without the terrible trouble and annoyance of striking a light. The happy possessor of this beautiful little apparatus has only to press a button, and lo! the enchanter is at his service, and he possesses a glimmer of light penetrating space to the extent of fully half an inch, or perhaps even more! The arrangement is warranted to require no attention or renewal for a year; but it is painful to think what might be the state of mind of a man who had got to love and trust his pocket-battery, when the twelvemonth had expired and fresh materials were not to be had. These things are quite pathetic, and might lead one to paraphrase the celebrated couplet, and say:

"Let gas and candles, oils, and matches die,
But leave us still our electricity!"

Verily we live in parlous times. When it is proposed to abolish night by providing our dwellings with self-luminous walls, and it is necessary to carry an electrical machine in our pocket to enable us to see our watches should we happen to be out of range of a wall or an electric lantern, we, who draw our means of subsistence from gas, should perhaps begin to prepare for speedy annihilation; but, somehow, we yet live, and, in our stupidity, may be pardoned for believing that our friend the Public will continue to strike matches to see the time and to light the gas for some little while longer.

## Correspondence.

*[We do not hold ourselves responsible for the opinions expressed by Correspondents.]*

### THE PRESENT POSITION OF THE ELECTRIC LIGHT QUESTION IN PARLIAMENT.

SIR,—I have been informed that the Committee appointed by the House of Commons to consider the electric light question will probably meet on Thursday next, the 17th inst., to appoint a Chairman, and determine the course of proceedings; and on the Monday following begin the inquiry. No notice has appeared in the votes of this arrangement, but it will, I have no doubt, be carried out, if practicable.

In considering what powers, if any, should be granted by Parliament to local authorities, gas or other companies, to enable them to supply light by electricity, it is necessary to have some clear understanding as to what are the powers which Parliament gives for the supply of gas.

At the present time there are in the United Kingdom between 1600 and 1700 gas undertakings, and of these there are about 500 with statutory powers, and 1200 without. It is not, therefore, absolutely necessary, however desirable it may be, to obtain parliamentary powers to supply a district with gas. It is, however, necessary for a company to have power to open streets at all times, and in all places within their own district, without interference. In the absence of any parliamentary powers for this purpose, the local authorities of the district can give the power; but they can also, at any future time, withdraw it; or, having granted it for one place, refuse it for another, and so prevent any extensions. But the power granted by Parliament is irrevocable and permanent, and hence, as no undertaking can be established on a solid foundation without power of opening the streets at discretion, it is unquestionably desirable, even though it may not be absolutely necessary, to have parliamentary powers.

It has been proved to the satisfaction of Parliament again and again that it is not beneficial to the public, but, on the contrary, very much the reverse, to grant to two companies in the same district a power to open the streets, and hence Parliament has now for many years steadfastly refused to allow it. When, therefore, a company possess these powers they have in effect a monopoly of the district to this extent, but no further, as any person may, notwithstanding this, erect gas-works on his own premises, and supply himself and neighbours with gas, provided he can do so without interfering with the streets; but as gas-works are unavoidably a nuisance, any person putting up such works on his own premises would be liable to indictment. Further, as gas cannot be manufactured and supplied to the public, on a small scale like this, so advantageously as by large works for the whole district, this right or power is never exercised, and the companies are left in secure possession of their respective districts. A monopoly for a gas undertaking is, therefore, not only advantageous to the public, but to some extent a necessity, for without it very few persons would be able to get a supply; but as the principle of monopolies is repugnant to all the laws, customs, and institutions of the country, Parliament, as a further safeguard to the public, always imposes upon the companies, when granting such powers, certain very stringent regulations, with heavy penalties in the event of failure. Some of these regulations are as follows:—That the gas supplied shall be uniformly of a certain quality as to illuminating power and purity, so as to secure at all times the same amount of light; that it shall be supplied at all times, day and night, and in any quantity that may be required; that any person living within a certain distance of the company's mains shall be entitled to demand a supply; that the supply within a certain limit shall be laid on at the company's expense; that the price and the dividend shall be limited, and, after paying the maximum dividend, the further profits shall be applied to a reduction of the price; that the half-yearly accounts shall be made up in a prescribed form, easily understood, printed, and deposited with the local authorities.

With the electric light, none of these provisions for the protection of the public are, with our present knowledge, possible. If any powers are granted for opening the streets to supply the electric light, they would, of necessity, take the form of an unrestricted monopoly. It would not be possible to prescribe any quality or intensity of the light, to make it at all times available, to make the supply compulsory to all persons requiring it, or in any conceivable way to regulate the price. All these matters would, of necessity, have to be left to the discretion of the parties undertaking the supply.

Electricity may be generated anywhere, without causing a nuisance, and probably more economically for the consumer in moderately small quantities than in large, as with gas; and it has been clearly demonstrated that it cannot be supplied through pipes in the street, except within a very limited distance. There is, therefore, no necessity for, and nothing to justify the granting of parliamentary powers to open the streets for such purposes. Any person can now supply himself with the electric light, or have it supplied by other persons, and there is no more necessity for parliamentary powers to supply it than there is for candles, oil, paraffin, or any other of the numerous articles now in use for supplying light.

None of the applications for powers to supply the electric light, either from local boards or gas companies, show any knowledge whatever of the difficulties of the subject, or make any proposal for the regulation or control of such a power. Generally they seem to be for powers to supply the electric light in the same way, and subject to the same conditions, as they now supply gas, and thus give to the consumer the power to demand a supply of the electric light or gas as he saw fit, and have either or both always ready for his convenience. In one or two instances some proposals have been made for regulating the price, but these are too visionary to discuss.

The electric light has had more than fair play—it has had a very partial trial. Indeed, the whole community has been in its favour, and very great and persevering efforts have been made to ensure its success; but they have only tended more and more to prove that it is wholly unsuitable for the general purposes to which gas is now applied, and that the gas companies have anything to fear from it at the present time. If, however, it should ever come to pass that the electric light is a formidable rival to gas, and very generally used in substitution for

it, gas companies will require something more than the mere power to supply the electric light. With their large establishments only half occupied, and their business daily decreasing, instead of increasing as before, they could not, even if they wished to do so, continue the supply on the same terms and conditions as hitherto; they would, of necessity, have to be relieved of all their statutory obligations respecting the supply of gas, and be allowed to supply either gas, the electric light, or anything else they saw fit, and on their own terms. It would, therefore, be very unwise on the part of any company to ask for such powers, or to attempt to define any regulations respecting them at the present time.

W. LIVESEY.

*Gas and Water Companies Association, 6, Victoria Street, Westminster Abbey, S.W., April 12, 1879.*

# Legal Intelligence.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, APRIL 1.

(*Before Vice-Chancellor* HALL.)

HARGREAVES *v.* FARNWORTH LOCAL BOARD.

ALLEGED POLLUTION OF WATER.

This was an action brought by the plaintiffs, who are extensive paper manufacturers, to restrain the defendants (the Local Board of Health) from so conducting their sewage operations as to pollute the water used by the plaintiffs in carrying on their works.

Mr. DICKINSON, Q.C., and Mr. INGLE JOYCE appeared for the plaintiffs; Mr. GRAHAM HASTINGS, Q.C., and Mr. RUSSELL ROBERTS for the defendants.

In support of their action, plaintiffs alleged that they had three sources of supply—the Birch Hall Brook, the Dry Bank Brook, and the River Croal; that before the operations of the defendants, the water was sufficiently pure for the plaintiffs works—not, perhaps, absolutely pure, but it could be used for domestic purposes, and was, in fact, drunk by cattle and some persons. However, from the time the Local Board commenced operations, the water had been found to be very foul, and that in February of this year the water reaching the plaintiffs reservoirs was so impure that they were obliged to stop their works. The principal part of the town of Farnworth was, until the last few years, rather south-west of the plaintiffs works; but latterly considerable building had taken place on the north. In the year 1861 the population of Farnworth was 8751, whereas it was now about 22,000, all contributing to the impurity of the water. The Local Board was established in 1863. At that time the principal member of the plantiffs firm, now dead, was in communication with the Board, and appeared to have assisted in devising certain plans which might remove any difficulty. But in 1868 complaint was made of the effect of the works on the Birch Hall Brook. The Board promised to do their utmost to remove all grounds of complaint, and they caused an invert and settling-tank to be made, which, however, were found ineffective. In 1871 and 1872, alterations were made with regard to the Dry Bank Brook. A culvert and intercepting-tank were constructed; and these again were found not to remedy the evil.

The defence was that there was no nuisance; but if there were, it was caused by dye-works and other things higher up the stream; that there never was clear water; that there were plenty of fish; that if there was any fouling, it was but temporary, and was caused by the frost in the commencement of the year; that a scheme was now under consideration which would do all the plaintiffs required; that that scheme only awaited the sanction of the Local Government Board; and when this was obtained, the necessary funds for carrying out the scheme could be raised, and which would be done.

WEDNESDAY, APRIL 2.

Council proceeded to read a vast amount of affidavit evidence, and correspondence extending over several years.

The following evidence was then taken:—

Mr. *William Smith*, cross-examined by Mr. HASTINGS.

I entered the works of the plaintiffs in 1851, and know the township of Great Lever, to the north of Farnworth, very well. The boundary between the two is the Dry Bank, or Hall Lane Brook. Great Lever is bordered by the River Croal. Farnworth runs right up to the river. I know the point on the river where there are two cottages; only the overflow passes them. There used to be an old watercourse, which is not shown on the plans, but it does appear on the Ordnance survey, to the left of No. 5 reservoir. The Devon Brook runs from the railway down towards reservoirs Nos. 4 and 5, and enters No. 5 to the west. The land falls from the railway towards the river. I do not know the course of the Birch Hall Brook before No. 1 reservoir was made. There was an open channel until the Hall Lane sewer was made. We cleaned out our filter-beds once a year until last July, but now we have to do so much more frequently. We have not done so since October. We cleanse by scraping the surface of the filter-beds. In October it occupied three weeks, and in July a month. The usual time occupied previously to July last was a week or a fortnight. There has been an increase in the time occupied during the last few years. There are six filter-beds altogether, covering 7480 yards. Two men were employed four days a week for three weeks. We always took water from the Hall Lane Brook previously to 1870, and that was one of the principal sources of supply. I recollect Mr. Rideout, one of our firm, being examined before the Rivers Pollution Commission in 1870. I never saw either the questions put or the answers given on that occasion.

Mr. Rideout being dead, Mr. HASTINGS proposed to put in the Queen's Printers copy of the report of the Commissioners, and the evidence presented to both Houses of Parliament.

Mr. JOYCE objected to the reception of this as evidence, and

The VICE-CHANCELLOR yielded to the objection.

Cross-examination continued: When I say in my affidavit that the township of Farnworth were dependent on the Birch Clough watercourse for a supply of water for drinking and domestic purposes, I mean more than 27 years ago. I will swear that in 1844 no house in King Street, Prince's Street, Bemcroft Road, and Market Street, drained into the Birch Clough watercourse. They were all provided with ordinary privies at that time, and the stream at that time was very clear. I know Birch Hall and Birch House, and I will swear that they did not drain into the watercourse at that time. I recollect the Bolton Water-Works being connected with Farnworth about 1854. The water supply before was from three wells in Farnworth, and one in Great Lever. Those were the only sources of supply. There was a stone cistern on Birch Clough Brook. In 1854 the water in Birch Clough was very clear. It took its rise at Dixon Green, and was supplied from springs; it was not surface water. It was not then used by any dye-works, cotton-mills, chemical-works, or foundries, to my knowledge. There were some coke-ovens just above Dixon Green; but they did not send their rubbish into the Birch Clough; nor the iron-works, formerly chemical-works, at the Albert Road; nor the dye-works either. Before 1863, when the Board was formed, I am certain that no works on the banks of the stream polluted the water in it. I do not know whether the sewage from Market Street went into the Birch Clough. In 1868 Mr. Rideout complained because there was no invert in the Birch Clough, and sewage and other matters were washed down to the plaintiffs works. The settling-tanks were made to catch what was brought down by the Birch Clough invert, which was constructed to receive the sewage. The object of the settling-tanks was to allow the solid matter to settle, and take the water into the reservoir. Mr. Rideout's idea was that exposure to the air and sun, and dropping, would deodorize it, and that was why he preferred an invert. We had more sewage conveyed to us after the invert had been made than previously came. The sewage has increased since the invert was constructed. I never heard that my employers suggested that the invert should be twice the size it is. In 1872 the Board made the Hall Lane sewer, and settling-tanks were constructed at the outfall by Mr. Rideout at his own expense. He also constructed a receiving-box to take the contents of the new sewer. There is a sluice which, when down, shuts off the contents of the Hall Lane sewer, and they would pass into reservoir No. 4, and not into the River Croal; but they would do so if both sluices that we have were down. I have seen the Local Board's men cleaning out the tanks; and this, two of the Board's officers—Mr. Thornley and Mr. Entwistle—agreed to do about two years ago. Previously to that, the Local Board had cleaned them out. When the Hall Lane sewer was made in 1872, a good deal of building was going on. Three or four years ago extensive building operations took place in Great Lever; and some of the houses drain into the Hall Lane watercourse. I met Mr. George Whitaker, who has built a great many of the houses, about the 12th of March last. I did not ask him to point out, nor did he do so, the course of the old channel. I knew it. I have seen the workhouse sewer; but, so far as I know, it is not yet in connection with the workhouse. Our works were stopped in the week ending Feb. 1, by an accumulation of sewage. It was not in consequence of a sudden thaw. Our tanks cannot contain all the sewage now sent down.

Re-examined by Mr. JOYCE: I have known Hall Lane Brook ever since I went to Farnworth, and am well aware of its ordinary course. The plaintiffs have used the water from Hall Lane Brook ever since I went to the works, which was in November, 1851.

*James Whewell*, cross-examined by Mr. ROBERTS, said: I have lived 18 years in the neighbourhood of Farnworth. I helped to put in the receiving-box to take the Hall Lane sewage. Before that, it used to run through the field, crossed the road, and down, by the cottages, close up to the river. The overflow water went there, and the other into the No. 5 reservoir. The condition of the water in the Birch Clough Brook is worse than it used to be, owing to the sewage matter coming in from the houses. When they have emptied the tanks there has been all sorts of dirt in them. I remember the gas-works which used to drain into the Birch Clough, and the Company had to pay damages for letting the refuse down.

*James Hewart*, cross-examined by Mr. HASTINGS, said: I know the boundary between Great Lever and Farnworth, which is what is called a sough. Before 1863 the water in Hall Lane Brook was clear and good, except in times of storm; but it changed when the sewage came in, about ten years ago. Refuse used to come into it from Rodney Cottages. Birch Clough and Hall Lane watercourse are worse than they were in 1874. I never heard that at that time all the privies were disconnected from the brook. I never heard of any drainage from the houses until the Local Board started.

*John Hulme*, cross-examined by Mr. ROBERTS, said: I am an engineer in the employ of the plaintiffs. I have been 35 years in their service. Thirty-five years ago the water in Birch Clough and Hall Lane Brook was very clear, but not so good as it was in 1832 or 1833, when we had a filter made to take the pollution out. Twenty years ago the water was better than it is now. During the past 12 months the water has been much discoloured. I have seen it red, brown, and yellow. I do not remember the gas-works being disconnected from the Birch Clough in 1874. I do not know any privies which drain into the Birch Clough now. I have drunk the water from the brook, without admixture, scores of times. Twenty years ago there were various kinds of fish in the reservoirs.

Mr. *James Edge*, cross-examined by Mr. HASTINGS, said: The boundary between Great Lever and Farnworth is a dingle with a drain in it. Twenty years since I have drunk the water in Hall Lane Brook. About 15 years ago I first noticed pollution in the brook, from increased population. The water is considerably worse now than it was formerly. I am not aware that in 1874 the closets in Farnworth were disconnected to keep the sewage out of the stream, nor that the accommodation at the Moses Gate Station on the Lancashire and Yorkshire Railway was discontinued.

MONDAY, APRIL 7.

Mr. GRAHAM HASTINGS, Q.C., followed by Mr. RUSSELL ROBERTS, addressed the Court for the defendants, contending that the plaintiffs had failed to substantiate their case—that, at all events in the earlier stages, Mr. Rideout, who was then the principal member of the plaintiffs firm, concurred in all that had been done; and that it was at least remarkable, if the stream were as pure as some of the witnesses had described, Mr. Rideout should have made provision for receiving the contents of the sewer. The purity of the stream, counsel contended, was a "fiction;" but that if it were otherwise, the plaintiffs had the means, if they chose to avail themselves of them, to shut off the Hall Lane sewer, the contents of which would then be diverted, and remove all possibility of pollution. The analyses of the water, which had been made by chemists, proved, it was contended, that it was really no worse than the water in the River Thames, the uses made of which were matters of public knowledge. It was clear, too, that the Hall Lane sewer received the drainage of several houses in Great Lever, over which the defendants had no control, as well as from the Moses Lane Station on the Lancashire and Yorkshire Railway; and, if the plaintiffs relied upon this pollution, they had brought the wrong defendants before the Court. With regard to the Birch House Clough, and the case founded on this point, reference was made to several cases, including *Baxendale v. M'Murray*, in which it was held that the defendant's predecessors having for more than 20 years polluted a stream, it was held that the onus was on the plaintiff to show that the pollution had been increased, that of his onus he had not discharged himself, and, consequently, had not established a claim for the interference of the Court. In the present case, it was argued that, so far from the plaintiffs having shown increase of pollution, the evidence was conclusive that the pollution had diminished. Not only was this established by evidence, but all the probabilities of the case supported it. Of this, the plaintiffs seemed to have been well aware, because, although they had given notice to cross-examine witnesses who had an intimate knowledge of the district, such as surveyors and others, they only called Mr. Thornley, the Clerk to the Board, whose knowledge of the subject was not of that practical kind to be of much real assistance to the Court. Indeed, all the witnesses for the plaintiffs broke down completely upon cross-examination, and negatived the case which the plaintiffs set up, of increased pollution; because it showed that the stream had, so long as living witnesses had known it, received the refuse of dye-works, and other establishments of a like kind; whereas, in truth, these sources of nuisance had now been discon-

nected, and the water in the clough was thereby materially improved. The evidence and the probabilities being in favour of the defendants, it became important to examine the correspondence which had taken place between the parties, to see whether it was at variance with, or corroborated the inevitable conclusion to be otherwise drawn; and this, the counsel contended, proved, as did the evidence and probabilities, that the plaintiffs had failed to make a case for the interference of the Court; because throughout the correspondence there was a manifest absence of that complaint which would undoubtedly have been found there, if the case made by the affidavits of the witnesses for the plaintiffs had any real foundation in fact. In short, it was perfectly plain that the Birch Clough, for some 20 years before the action was brought, had been little better than a sewer, receiving drainage from the houses in Farnworth, as well as from factories all along its course; and it being equally plain that the water in the clough was even better now than it was originally, the Court would be slow to interfere with the operations of the Local Board of Health, having for their object a great public benefit; and would refuse to grant the injunction which the plaintiffs asked. But if the Court should be against the defendants, as was customary in such cases, it would suspend the injunction for a sufficient length of time to enable the Local Board to carry out the scheme which they had in contemplation, and which, it was not denied, they had used due diligence to complete.

Without calling on the plaintiffs counsel in reply,

The Vice-Chancellor, in the course of an elaborate judgment, reviewed the evidence, oral and by affidavit, at length, and said the question was one of fact—viz., what was the state of the water previous to the construction of the sewer in 1872? Upon this the testimony was conflicting; but he was satisfied the plaintiffs had a valuable supply of water for their works formerly; but it had been fouled by the defendants to a material extent. It was said the plaintiffs had the means of shutting off the pollution; but that was a contention which he did not think the defendants were entitled to raise. The water had unquestionably been polluted, and he did not think the sources of pollution could be traced to anything but the defendants operations. The water brought to the plaintiffs reservoirs was now too impure for their purposes as paper manufacturers, whereas formerly it could be made sufficiently pure for their use. As to the point of acquiescence, it could not be carried further than that the plaintiffs did not wish to hamper the defendants, so long as when the water reached their premises it was fit for the purposes of their trade. It was said there was an absence of complaint; but that was a misapprehension, because complaints had been frequent. He considered the plaintiffs had been substantially right from beginning to end, and were entitled to the injunction which they asked, with costs. The injunction would be suspended until Michaelmas Sittings, with liberty to the plaintiffs to apply if there were any evidence of negligence on the part of the Board, the defendants undertaking to cleanse the reservoirs as and when required.

## BATH POLICE COURT.—Thursday, March 27.

(*Before the* Mayor, *Chairman, and a Bench of Magistrates.*)

CHARGE OF STEALING GAS.

*John Preater*, stay manufacturer, of 7, Beaufort Square, Bath, was charged with having stolen a large quantity of gas, the property of the Bath Gaslight and Coke Company.

Mr. E. C. Petgrave represented the Company; Mr. J. K. Babtrum appeared for the prisoner.

*Joseph Davis*, Chief Inspector to the Bath Gaslight and Coke Company, said that in consequence of information he had received he went to the prisoner's house about seven o'clock on the previous Wednesday evening. He saw a female who showed him a gas-meter fixed against the wall in the kitchen opposite the staircase. The meter was connected with the main and with the fittings in the house. A piece of fur above the meter effectually hid a pipe which he observed on removing the fur, so gas could pass into the house pipes without using the meter at all. He left the meter in charge of Inspector Berry and one of the Company's workmen. He then proceeded to examine the house, and ascertain the number of burners. He found in the cooking-room one large gas-stove, three burners on the top, and one burner inside, that inside being pierced with 60 holes; a second gas-stove with two burners on the top, and a burner inside pierced with 60 holes; a piece of half-inch iron pipe, connected to an india-rubber tube, with 30 holes; one atmospheric stove, pierced with 130 very small holes; one gas-stove with inside burner, pierced with 75 holes; one small reflecting or pot cooking-stove, not connected; two bracket burners, one three-eighths connection; a tube for connection, but not connected. In a store place, off the kitchen, he found one heating-stove, and one bracket burner. In the kitchen itself he found one pendant with one burner, and two taps fixed by the fireplace, such as are used for connecting india-rubber tubes. On the entrance floor he found a bracket and a pendant in the passage, each with one burner. In the front sitting-room one gaselier with three burners and one tap for connecting a portable lamp, one gas-fire, and three bracket burners. In a small work-shop, one bracket burner, one double bracket with three burners, one tap for a flexible tube, and a table-lamp, not connected. In the scullery place on the same floor, one bracket burner and one ⅜-inch tube connection. He also found a piece of pipe with four burners, not connected, on the first or drawing-room floor. He found a bracket burner on the staircase, and a table-lamp in a room, not connected. One gas-fire, one small gas-stove by a bedstead, one ⅜-inch tap for a flexible tube, two bracket burners in a closet in the room, and there was one bracket burner upon a landing. He tested and found gas at every burner. If more than 70 feet of gas per hour were consumed, the extra would pass through the meter, but up to 70 feet or thereabouts no consumption would be registered. The arrangements exhibited considerable ingenuity. The fittings were adapted for a large consumption of gas. The meter produced was what is called a 5-light meter. It might be possible to take from it a sufficient supply for 20 lights, burning 4 or 5 feet per hour. The meter was a private one, not supplied by the Company. It bears the Government test stamp. On returning to the kitchen, prisoner was fetched. He (witness) pointed out to him the connecting-pipe with the meter, and asked him if he had anything to say about it—any explanation to make. He said, "No." Witness told him he should charge him with wilfully and surreptitiously stealing a large quantity of gas, the property of the Bath Gas Company. He made no reply, and witness gave him into custody.

*Joseph Bullock*, a brass finisher in the employment of the Gas Company, deposed to having accompanied last witness to prisoner's house, and generally corroborated his evidence.

*Edward Francis Uncles*, meter index taker in the employment of the Gas Company, said he went the round which included Beaufort Square. The last time before the 25th of March that he took the index of prisoner's meter was on the 11th of November, and the previous occasion was on the 30th of September. Between those two dates the consumption registered was 900 feet. The total consumption registered against the prisoner from the time he began to consume—viz., Jan. 23, 1878—was 6900 feet. Witness did not notice anything over the meter when he last took the index.

Inspector *Berry* deposed to charging prisoner, but he made no reply, and he then removed him to the Central Police Station. Mr. Davis there made an allusion to the cooking-stoves, but prisoner said they were not all attached.

The prisoner was remanded till the following Monday, but was allowed bail, himself in £40 and two sureties in £20 each.

### Monday, March 31.

The hearing of this case was resumed to-day.

*Joseph Davis*, cross-examined by Mr. Babtrum, said he did not think the whole of the burners found in prisoner's house would be lighted at the same time, but the false pipe was sufficient to have supplied them.

By the Bench: The pipe would pass 70 feet of gas per hour, and under great pressure, the whole of the pipes might pass a much larger quantity—from 300 to 400 feet.

*Joseph Bullock*, recalled, stated that he visited prisoner's house in company with the last witness. The soldering on the false pipe appeared to have been there for months.

*Edward Francis Uncles*, recalled, stated that in the winter months it was customary for gas consumers to wrap up their meters, to protect them from the frost. In this case, the only part of the meter which was covered was the illegal part.

*George Smith*, gas-fitter, said he was in the employ of the Gas Company, and fixed the meter produced at the prisoner's house on the 23rd of January, 1878. He entered the index of the meter, which was 69,000 feet. Prisoner was present at the time. On the following morning witness supplied the figures to the inspector, as was customary.

By the Bench: I fixed the meter in the kitchen of prisoner's house, and never saw it again after it had been put up. I left the meter connected with the inlet-pipe in the usual way. It is not now as I left it; the pipes seem to have been altered. The soldering on the false pipe is not fresh—it looks old to me. I form my judgment of it by the appearance. The false pipe seems to have been attached to the meter by an amateur.

*Henry Bright* said he was the collector of the gas-rates, and, in his official capacity, it had been his duty to go to prisoner's house each quarter. No complaint as to deficiency of gas had ever been made to him. It was his practice to deliver a gas account each quarter, and this was in every case upon a printed form. This form contained directions to consumers.

*James Henry Baker* said he was one of the Company's index takers. He took the index of prisoner's meter at his house on the 18th of February of the present year. It registered 79,500 cubic feet, and he now produced the book containing the entry made at the time.

*William Price*, another index taker, said that on December 30, 1878, he found prisoner's meter had registered 77,200 cubic feet.

*William Harper* said he was landlord of the house No. 7, Beaufort Square. He did not know what gas-fittings were in the house. At the time prisoner took the house there was only an inlet-pipe. He had known prisoner for 20 years, and he had always borne a good character.

This being the whole of the evidence,

Mr. Babtrum addressed the Bench on behalf of the prisoner. He said the proceedings might be for larceny, or under the Gas-Works Clauses Act for unlawfully tampering with a meter. If his friend preferred the charge of larceny, the difficulties with which he (Mr. Bartrum) would have to contend would be insuperable; but if he proceeded under the Gas-Works Clauses Act he should have something to say to their Worships upon it.

Mr. Petgrave: The case concerns the public just as much as it does the Gas Company.

The Clerk: The prisoner declines to plead guilty to larceny?

Mr. Babtrum: Certainly.

After a short private consultation between the parties,

Mr. Petgrave said: The case must take its course as one of larceny.

The Clerk: Then you do not consent to the case being tried here?

Mr. Babtrum: No.

Prisoner was then formally charged with feloniously stealing gas of the value of one-eighth of a penny, the property of the Bath Gas Company, and pleading "Not guilty," he was committed for trial at the Sessions, bail being allowed.

[On Monday, the 7th inst., the above case was tried at Quarter Sessions, before the Recorder. The prisoner pleaded "Guilty," and was sentenced to one month's imprisonment, with hard labour.]

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London Association of Foremen Engineers and Draughtsmen.—The twenty-sixth anniversary festival of this Association was recently held at the Cannon Street Hotel, when about 300 gentlemen sat down to dinner—Mr. Richard Christopher Napier, C.E., presiding. The usual loyal and patriotic toasts were drunk, after which, "The Success of the Foremen Engineers of London" was proposed by the Chairman, and responded to by Mr. Joseph Newton, the President of the Association, who, in turn, proposed "Engineering Employers in Town and Country." To this toast Mr. A. Ransom, C.E., of Ipswich, and Mr. W. H. Bailey, C.E., of Salford, replied. The latter gentleman, in the course of a humorous speech, said he would venture to make a few observations about the electric light, presuming that many in that great audience, consisting as it did of scientific and mechanical men, knew something of heat, light, energy, and motion. The electric light might be considered useful for a lighthouse, where a great amount of brilliance was required in one place; or, say, in the middle of a large square; but to him it seemed that to get light by friction, which was the way in which the electric light was produced, was a most brutal use of coal. First, energy was obtained from coal under the boiler; thence it was transmitted into the boiler, after wasting fully 90 per cent. up the chimney; for it was admitted that only about 10 per cent. of heat from the coal was yielded by the present method. The steam being thus produced, it was taken to the engine-piston; and if it was a good engine, 85 per cent. was obtained, and the revolutions of the fly-wheel being retarded by bits of soft iron and magnets, a spark called the electric light was produced. He must say that such a method of obtaining light, considered on scientific grounds, was only one step better than the method of the poor troglodyte of the old stone age. This poor fellow, in times when legs had no calves, and heads had but little brains—for neither had been developed—this poor child of nature struck a light by friction with a wooden drill and a stone. Time and energy being of not much account, he devoted an afternoon to the creation of a bonfire, and when it was lighted, he sounded the tom-tom, and asked his fellow-savages to go down on bended knee, and thank their many devils because of their luck. The electric light, as at present produced, was a wasteful, prodigal, and clumsy use of coal. The present method of making gas might leave room for improvement; but, under the worst condition, coal used in a retort and under it was using the sunbeams of ancient days with some respect for scientific knowledge, and of the teachings of those who instructed men of the value of the British unit of heat. If people wanted good light, let them double their gas bills and purchase better burners, and even then the cost would be one-fourth that of the electric light.

# Parliamentary Intelligence.

## HOUSE OF COMMONS.

MONDAY, APRIL 7.

The Birmingham Gas Bill, as amended, was considered; amendments made; Bill to be read the third time.

Rawmarsh Local Board Bill, Sleaford Water Bill,—as amended considered; to be read the third time.

The Dun Drainage Bill was brought from the Lords, read the first time, and referred to the Examiners.

The Examiners reported that no Standing Orders not previously inquired into are applicable in the case of the West Kent Main Sewerage Board Bill.

### LIGHTING BY ELECTRICITY.

On the motion of Viscount SANDON, it was ordered that Mr. Puleston and Mr. Rylands be added to the Select Committee on Lighting by Electricity.

### IMPROVED PUBLIC LIGHTING BY GAS.

Sir J. M'KENNA asked the First Commissioner of Works whether he had observed the brilliant gas-lamps placed on the end of Westminster Bridge, opposite to the St. Stephen's Club, and if he did not consider some of those lamps might be placed at the entrance to Westminster Hall and at the entrance to the House.

Mr. NOEL said he had seen the lamps referred to, which were undoubtedly far superior to the general run of street-lamps; but, considering the division of opinion which at present existed with regard to public lighting, the advantages to be anticipated from the change did not seem to warrant the Commissioners of Works in going to the expense of placing such lamps at the entrance to Westminster Hall, and at the entrance to the House.

# Miscellaneous News.

## NATIONAL WATER SUPPLY.

The following correspondence on the above subject appeared in the *Journal of the Society of Arts* last Friday:—

"*March* 24, 1879.

"My Lord,—As President of the Society of Arts, I have the honour to transmit to your Lordship the enclosed copy of a resolution, which was passed at a Conference, held by the Society in May, 1878, on the subject of National Water Supply. The Conference was held in consequence of a suggestion of my own to the Council, and it was attended by many of the most influential authorities on this subject in the country.

"I need not urge upon your Lordship the necessity for providing a supply of pure water to the population of this country. At the present time, our great cities are endeavouring, each for itself, to secure a sufficient supply, while the smaller country towns and villages are dependent solely upon accidental sources.

"Should Her Majesty's Government be able to accede to the wishes of the Conference, by appointing a Commission such as that suggested, the first duty of the Commission would probably be to collect information. They would then be in a position to take measures for establishing such an organization as might ensure that the existing abundant supplies of water should be dealt with in such a manner as to secure a regular provision, both in towns and country districts, of this first necessity for health and comfort.

"The feeling of the Conference was that it would be better simply to urge upon the Government the appointment of such a Commission, without endeavouring to suggest the means which might be employed, after sufficient information was collected, to remedy the present state of things.

"The growing importance of the question it would be difficult to overrate, nor can it be successfully dealt with except by the authority of the Government. The Society of Arts have already drawn special attention to it, and will continue their endeavours to promote its public discussion, but beyond this it is obvious they can no further go.

"I have the honour to be, my Lord,

"Your Lordship's obedient servant,

(Signed) "ALBERT EDWARD P.,

"President of the Society of Arts.

"The Right Honourable the Earl of Beaconsfield, K.G."

[COPY OF RESOLUTION.]

"Resolved:—'That this Congress desires to urge upon Her Majesty's Government the importance of taking steps, with the least possible delay, to appoint a small permanent scientific Commission, to investigate and collect the facts connected with water supply in the various districts throughout the United Kingdom, in order to facilitate the utilization of the national sources of water supply for the benefit of the country as a whole, as suggested by His Royal Highness the Prince of Wales, the President of the Society of Arts; and recommends that the Council of the Society of Arts be requested to ask Earl Beaconsfield to receive a deputation to present a resolution and advocate its adoption.'"

The following is the reply of the Earl of Beaconsfield:—

"10, *Downing Street, Whitehall, March* 31, 1879.

"Sir,—I have the honour to acknowledge the receipt of your Royal Highness's letter of the 24th inst., forwarding a copy of a resolution passed at a Conference on National Water Supply, held at the Society of Arts in May, 1878, and I have to inform your Royal Highness that I have referred the matter to the Board of Treasury, for the careful consideration of their Lordships.

"I have the honour to be, Sir,

"Your Royal Highness's obedient servant,

(Signed) "BEACONSFIELD."

## METROPOLIS WATER SUPPLY.

The following is Dr. Frankland's report on his analyses of the Metropolitan Water Supply during March, 1879:—

"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending 1876 as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Kent, 1·5; Colne Valley, 1·5; Tottenham, 1·7; New River, 2·9; Lambeth, 3·8; East London, 4·0; West Middlesex, 4·6; Southwark, 4·8; Chelsea, 4·9; Grand Junction, 5·0. The water taken from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies, though of better quality than in February, was still suffering from organic contamination. The best water supplied from this source was delivered by the Lambeth Company, and the worst by the Chelsea Company. The last-named Company's water contained fungoid growths and moving organisms in consequence of inefficient filtration. The water taken from the Lea by the New River and East London Companies was of somewhat better quality; it was not efficiently filtered, however, by the last-named Company, and moving organisms were found in the water drawn from the mains of this Company. The New River Company's water was also slightly turbid, but not from inefficient filtration. It contained crystalline films of carbonate of lime. The deep-well water delivered by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was clear and of its usual excellent quality for dietetic purposes. The only soft water fit for washing was supplied by the Colne Valley Company. Seen through a stratum 2 feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; Lambeth, clear and very pale yellow; New River and East London, slightly turbid and very pale yellow; West Middlesex, Southwark, and Grand Junction, clear and pale yellow; Chelsea, slightly turbid and pale yellow."

*Results of Analyses expressed in Parts per* 100,000.

| Companies or Local Authorities. | Total Solid Matters. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen, as Nitrates and Nitrites. | Total combined Nitrogen. | Chlorine. | Total Hardness. |
|---|---|---|---|---|---|---|---|---|
| *Inner Circle.* | | | | | | | | |
| Thames— | | | | | | | | |
| Chelsea | 27·70 | ·251 | ·040 | 0 | ·205 | ·245 | 1·5 | 20·3 |
| West Middlesex | 30·22 | ·240 | ·032 | 0 | ·257 | ·289 | 1·5 | 21·8 |
| Southwark | 32·62 | ·216 | ·065 | 0 | ·255 | ·320 | 1·5 | 22·1 |
| Grand Junction | 30·92 | ·247 | ·047 | 0 | ·252 | ·299 | 1·5 | 21·8 |
| Lambeth | 32·86 | ·199 | ·025 | 0 | ·298 | ·323 | 1·5 | 23·6 |
| Lea— | | | | | | | | |
| New River | 31·82 | ·152 | ·022 | 0 | ·336 | ·358 | 1·6 | 21·8 |
| East London | 33·94 | ·198 | ·037 | 0 | ·291 | ·328 | 1·7 | 23·9 |
| Deep wells—Kent | 42·10 | ·070 | ·017 | 0 | ·499 | ·516 | 2·5 | 28·1 |
| *Outer Circle.* | | | | | | | | |
| Colne Valley | 15·60 | ·076 | ·014 | ·005 | ·404 | ·422 | 1·4 | 7·1 |
| Tottenham Local Board | 40·52 | ·083 | ·015 | ·076 | ·028 | ·105 | 2·8 | 22·2 |
| Corporation of Birmingham* | 21·40 | ·186 | ·045 | ·004 | ·297 | ·345 | 2·1 | 12·4 |
| Corporation of Glasgow† | 2·92 | ·143 | ·015 | 0 | ·008 | ·023 | 0·60 | 1·01 |

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

The Registrar-General publishes the following report on the average daily quantity of water supplied to London during March, 1879. According to the returns furnished to him by the Metropolitan Water Companies, 129,561,232 gallons, or 588,656 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 232 gallons (105·4 decalitres), rather less than a *ton* by weight, to each house, and 32·7 gallons (14·9 decalitres) to each person, against 31·2 gallons during March, 1878.

| Companies. | Number of Houses, &c., supplied in Mar., 1878. | Mar., 1879. | Aver. Daily Supply of Water in Gallons* during Mar., 1878. | Mar., 1879. |
|---|---|---|---|---|
| Total supply | 541,894 | 557,774 | 120,026,106 | 129,561,232 |
| From Thames | 255,659 | 263,721 | 60,589,557 | 65,954,316 |
| ,, Lea and other Sources | 286,235 | 294,053 | 59,436,549 | 63,606,916 |
| THAMES. | | | | |
| Chelsea | 28,859 | 29,562 | 7,840,600 | 8,581,900 |
| West Middlesex | 50,422 | 51,771 | 9,393,895 | 10,099,458 |
| Southwark and Vauxhall | 80,159 | 82,797 | 18,550,000 | 23,085,273 |
| Grand Junction | 37,910 | 38,989 | 11,396,662 | 11,035,985 |
| Lambeth | 58,309 | 60,602 | 13,408,400 | 13,151,700 |
| LEA AND OTHER SOURCES. | | | | |
| New River | 126,300 | 127,839 | 26,214,000 | 26,628,000 |
| East London | 115,143 | 118,910 | 25,986,000 | 29,343,000 |
| Kent | 44,792 | 47,304 | 7,236,549 | 7,635,916 |

* Including that for manufactures and for various purposes other than for domestic consumption.

*Note.*—The return for March, 1879, as compared with that for the corresponding month of 1878, shows an increase of 15,880 houses, and of 9,535,126 gallons of water supplied daily.

## SOUTH METROPOLITAN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held at the Terminus Hotel, London Bridge, on Monday, the 7th inst.—Captain HEATHORN in the chair.

The SECRETARY (Mr. George Livesey) read the notice convening the meeting, and the following report and statement of accounts were submitted:—

The Directors have the pleasure to report that, in the past half year, the prosperity of the Company has been fully maintained.

The business has shown an increase of 8 per cent. in 1878 over 1877, and, so far as an opinion can be formed, this rate of increase seems likely to continue, owing to the impulse that has lately been given to the use of gas for cooking and heating purposes, in addition to its constantly extending use as the best and cheapest light-giving agent—a fact which the experience of the past few months has done much to fix in the public mind.

The actual addition to the business of the Company in the past year, coupled with the fact that the consumption of gas in the present year greatly exceeds that during the corresponding period of 1878, has compelled the Directors to put in hand, without delay, another retort-house, in order to have more gas-making power before next winter. A large gasholder-tank will also be begun at once.

The whole of the original capital having been paid up, it will be necessary, in order to raise the money for these extensions, to exercise the powers conferred on the Company by the Act of 1869, which authorizes the issue of £62,500 as debenture stock, at a rate of interest not exceeding 6 per cent. A resolution to effect this will be submitted to the Shareholders for their approval. A portion of the money will probably be wanted by Michaelmas next.

The Directors regret to announce the retirement, through failing health, in his 90th year, of Mr. Thomas B. Simpson, which necessitates the election of a Director in his place. He has been a Director for nearly 40 years, and for a great portion of that time has acted as Chairman. Mr. Simpson has in many ways assisted in establishing the Company on a firm basis, and has shown the greatest devotion to its interests.

By the Company's Act of Incorporation, one Director retires from office at this meeting, and also one Auditor.

Julian Hill, Esq., as Director, and A. Footner, Esq., as Auditor, will, therefore, retire; but these gentlemen, being eligible, offer themselves for re-election.

The accompanying accounts show that the profit is sufficient to pay the dividend of 11½ per cent., to which, under the sliding scale, the Shareholders are entitled; to add 1 per cent. to the insurance-fund, and to carry forward a balance to the credit of the next half year.

### No. 1.—STATEMENT OF SHARE CAPITAL *on Dec.* 31, 1878.

| Acts of Parliament authorizing the Raising of Capital. | Description of Capital. | Standard Dividend. | Number of Shares issued. | Nominal Amount of Shares. | Called up per Share. | Total paid up. | Amount not paid up. | Total Amount authorized. |
|---|---|---|---|---|---|---|---|---|
| 5 Vict., cap. 79 | Share. | 10 per cent. | 4,000 | £50 0 0 | £50 0 0 | £200,000 0 0 | .. | £200,000 0 0 |
| | | | 4,000 | 12 10 0 | 12 10 0 | 50,000 0 0 | .. | 50,000 0 0 |
| 32 & 33 Vict., cap. 130 | Do. | Do. | 20,000 | 12 10 0 | 12 10 0 | 250,000 0 0 | .. | 250,000 0 0 |
| 39 & 40 Vict., cap. 229 | Do. | Do. | .. | .. | .. | .. | 250,000 0 0 | 250,000 0 0 |
| | | | | | | £500,000 0 0 | £250,000 0 0 | £750,000 0 0 |

### No. 2.—STATEMENT OF LOAN CAPITAL.

| Acts of Parliament authorizing Loan Capital. | Description of Loan. | Rate per Cent. of Interest. | Total Amount Borrowed. | Remaining to be Borrowed. | Total Amount Authorized. |
|---|---|---|---|---|---|
| 32 & 33 Vict., cap. 130. | .. | Not exceeding 6 per Cent. | Nil. | £62,500 | £62,500 0 0 |
| 39 & 40 Vict., cap. 229 | .. | Ditto. 5 ditto. | Nil. | 187,500 | 187,500 0 0 |
| | | | | £250,000 | £250,000 0 0 |

### No. 3.—CAPITAL ACCOUNT.

**Dr.**

| | | |
|---|---|---|
| To Expenditure to June 30, 1878 | .. | £471,153 14 10 |
| Expenditure during half year to Dec. 31, 1878, viz.— | | |
| New buildings and machinery in extension of works | £2,515 10 5 | |
| New and additional mains and services | 8,040 5 6 | |
| New and additional meters | 1,015 19 4 | |
| | | 11,571 15 3 |
| Total expenditure | .. | £482,725 10 1 |
| Balance | .. | 17,274 9 11 |
| | | £500,000 0 0 |

**Cr.**

| Description of Capital. | Certified to June 30, 1878. | Received since that Date. | Total to Dec. 31, 1878. |
|---|---|---|---|
| By Shares, at £50 each | £200,000 0 0 | .. | £200,000 0 0 |
| Do., at £12 10s. each | 50,000 0 0 | .. | 50,000 0 0 |
| Do., at £12 10s. each, £11 10s. paid £1 on Oct. 1st | 230,000 0 0 | 20,000 0 0 | 250,000 0 0 |
| | £480,000 0 0 | 20,000 0 0 | £500,000 0 0 |

### No. 4.—REVENUE ACCOUNT, *for the Half Year ended Dec.* 31, 1878.

| | | |
|---|---|---|
| To Manufacture of gas— | | |
| Coals, including dues, carriage, unloading, and trimming. (See Account No. 9) | £39,814 4 7 | |
| Purification, including £823 7s. 11d. for labour | 1,835 13 6 | |
| Salaries of Engineer, Superintendent, and officers at works | 1,352 2 0 | |
| Wages (carbonizing) | 9,413 11 8 | |
| Repairs and maintenance of works and plant, materials, and labour—less £168 12s. 11d. received for old materials | 5,642 19 11 | |
| | | £58,058 11 8 |
| Distribution of gas— | | |
| Repair, maintenance, and renewal of mains and service-pipes, including labour | £2,221 5 11 | |
| Salaries and wages of Officers (including Rental Clerks) | 1,796 18 0 | |
| Repairing and renewals of meters | 1,026 3 4 | |
| | | 5,044 7 3 |
| Public lamps— | | |
| Lighting and repairing | | 1,830 15 9 |
| Rents, rates, and taxes— | | |
| Rents payable | £284 12 4 | |
| Rates and taxes | 2,112 3 4 | |
| | | 2,396 15 8 |
| Management— | | |
| Directors allowance | £900 0 0 | |
| Salaries of Secretary and Clerks | 750 4 2 | |
| Collectors commission | 789 0 11 | |
| Stationery and printing | 268 15 6 | |
| General charges | 375 15 4 | |
| Company's Auditors | 50 0 0 | |
| | | 3,133 15 11 |
| Bad debts | | 384 4 6 |
| Superannuation-fund | | 438 12 0 |
| Gas Referees and Official Auditor | | 112 2 7 |
| Total expenditure | | £71,399 5 4 |
| Balance carried to net revenue account, No. 5 | | 33,791 8 5 |
| | | £105,190 13 9 |

| | | |
|---|---|---|
| By Sale of gas— | | |
| Common gas (per meter), at 3s. per 1000 cubic feet | £68,765 13 8 | |
| Less discount | 131 13 7 | |
| | £68,634 0 1 | |
| Public lighting and under contracts (see Statement No. 11) | 7,951 14 11 | |
| | | £76,585 15 0 |
| Rental of meters | | 1,680 6 1 |
| Residual products— | | |
| Coke, less £1268 3s. 11d. for labour and cartage | £16,391 11 10 | |
| Breeze, less £182 10s. 6d. for labour and cartage | 464 4 6 | |
| Tar | 3,905 13 5 | |
| Ammoniacal liquor | 5,976 15 0 | |
| | | 26,738 5 6 |
| Rents receivable | | 180 14 8 |
| Transfer fees | | 5 12 6 |
| Total receipts | | £105,190 13 9 |

### No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

| | | | |
|---|---|---|---|
| Interest on deposits | £72 12 1 | Balance from last account | £47,458 19 8 |
| Amount carried to insurance-fund | 5,000 0 0 | Less dividend on ordinary capital for the half year ending June 30, 1878 | 27,600 0 0 |
| Balance applicable to dividend on ordinary share capital | 49,001 0 2 | | £19,858 19 8 |
| | | Amount from revenue account, No. 4 | 33,791 8 5 |
| | | Interest on moneys on deposit | 423 4 2 |
| | £54,073 12 3 | | £54,073 12 3 |

### No. 6.—RESERVE-FUND.

| | | | |
|---|---|---|---|
| Balance on Dec. 31, 1878 | £20,961 8 6 | Balance on June 30, 1878 | £20,636 4 8 |
| | | Interest on amount invested | 325 3 10 |
| | £20,961 8 6 | | £20,961 8 6 |

### No. 7.—RENEWAL-FUND (LEASEHOLD).

| | | | |
|---|---|---|---|
| Balance on Dec. 31, 1878 | £10,564 0 10 | Balance on June 30, 1878 | £10,399 17 4 |
| | | Interest on amount invested | 164 3 6 |
| | £10,564 0 10 | | £10,564 0 10 |

### No. 8.—INSURANCE-FUND.

| | | | |
|---|---|---|---|
| Balance on Dec. 31, 1878 | £12,991 5 7 | Balance on June 30, 1878 | £7,942 17 10 |
| | | Interest on amount invested | 48 7 9 |
| | | Amount brought from net revenue account | 5,000 0 0 |
| | | £7991 5s. 7d. invested in Consols. £5000 to be invested | |
| | £12,991 5 7 | | £12,991 5 7 |

### No. 9.—STATEMENT OF COALS.

| Description of Coal. | In Store, June 30, 1878. | Received during the Half Year. | Carbonized during the Half Year. | Used during the Half Year. | In Store, Dec. 31, 1878. |
|---|---|---|---|---|---|
| | Tons. | Tons. | Tons. | Tons. | Tons. |
| Newcastle coal | 4,756 | 61,000 | 53,182 | 66 | 12,508 |
| Cannel coal | 1,387 | 2,369 | 2,947 | .. | 809 |
| | 6,143 | 63,369 | 56,129 | 66 | 13,317 |

### No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

| | In Store, June 30, 1878. | Made during Half Year (estimated). | Used in the Half Year (estimated). | Sold in the Half Year. | In Store, Dec. 31, 1878. |
|---|---|---|---|---|---|
| Coke . Chaldrons of 36 bushels. | 2,230 | 55,146 | 15,520 | 39,546 | 2,310 |
| Breeze do. 36 do. | 243 | 4,106 | 1,100 | 2,266 | 983 |
| Tar . Gallons | 40,684 | 618,046 | 1,200 | 640,244 | 17,286 |
| Ammoniacal liquor—Butts of 108 gallons, 10-oz. strength | 957 | 10,882 | .. | 8,226 | 3,613 |

### No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

| Description of Gas. | Quantity made, partly measured in Gasholders. | Quantity Sold. | | | Quantity used on Works, &c., partly estimated. | Total Quantity accounted for. | Quantity not accounted for. | Number of Public Lamps. |
|---|---|---|---|---|---|---|---|---|
| | | Public Lights and under Contracts (estimated). | Private Lights (per Meter). | Total Quantity sold. | | | | |
| | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | |
| Common | 548,115 | 44,173 | 458,438 | 502,611 | 5,500 | 508,111 | 40,004 | 4,207 |

No. 12.—BALANCE-SHEET.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| To Capital— | | | | By Cash at Bankers | | | £12,041 7 6 |
| For balance, per account No. 3 | | | £17,274 9 11 | Amount invested in Three per Cent. Consols— | | | |
| Reserve-fund— | | | | Reserve-fund | £20,961 8 6 | | |
| For balance, per account No. 6 | | | 20,961 8 6 | Renewal-fund | 10,564 0 10 | | |
| Renewal-fund— | | | | Insurance-fund | 7,991 5 7 | | |
| For balance, per account No. 7 | | | 10,564 0 10 | | | | 39,516 14 11 |
| Insurance-fund— | | | | Cash in hand for freight, accounts, &c. | | | 1,000 0 0 |
| For balance, per account No. 8 | | | 12,991 5 7 | Stores in hand— | | | |
| Net revenue account— | | | | Coals | £8,994 7 3 | | |
| For balance, per account No. 5 | | | 49,001 0 2 | Coke and breeze | 1,274 4 0 | | |
| Sundry tradesmen, for amount due for coals, stores, and sundries | | | 6,098 14 1 | Tar and ammoniacal liquor | 2,064 19 5 | | |
| Deposits by consumers | | | 5,841 9 10 | Sundry stores | 2,280 0 7 | | |
| Property-tax account | | | 818 12 3 | | | | 14,613 11 3 |
| Dividend account (outstanding) | | | 36 6 6 | Accounts due to the Company— | | | |
| | | | | Gas and meter rental, quarter ending Dec. 31, 1878 | £51,656 13 7 | | |
| | | | | Arrears outstanding | 620 0 0 | | |
| | | | | | | | 52,276 13 7 |
| | | | | For coke and other residual products | | | 3,710 9 7 |
| | | | | Sundries | | | 428 10 10 |
| | | | £123,587 7 8 | | | | £123,587 7 8 |

The Chairman moved the adoption of the report and accounts.

The Deputy-Chairman (Mr. R. Foster) seconded the resolution.

Mr. Julian Hill, whose name appeared in the report as a retiring Director, but as eligible for re-election, said that when that notice was put into print he was under the impression that the usual course would be adopted—namely, that the re-election of the retiring Director would not be opposed. Of course, it was perfectly legal to oppose the re-election of a retiring Director, but it was an unusual course. It had not hitherto been thought desirable that a Director who had learned his business should be turned out of his office, and that his seat at the Board should be made a bone of contention. It might, of course, seem rather hard, when one had borne the heat of the day, to be turned out of the vineyard. Still, as a Company, they were not there to vote on the matter of whether one gentleman or another should be on the Board; they were there to make good gas, and to pay good dividends. After that announcement appeared in the report, the unusual course was adopted by the Chairman and some of his colleagues of sending out proxies, in order to oppose the re-election of one who had been a Director. That was rather a strong measure; at the same time, had his colleagues told him distinctly that they were going to combine against him in that way, he would have declined to offer himself for re-election. Had any number of Proprietors told him they did not wish him to stand again, he should have said he was proud to serve them as long as he had their confidence, but he certainly would not have troubled them by again appearing before them. He had held his seat upon the Board for nearly eight years, having been asked to join the Company 24 years ago by the father of the present Chairman. The proxies, however, had been issued, signed by Chairman, Director, and Secretary, and, looking to all that had happened, he had nothing further to do than to thank them for the kindness they had shown him for many years, and to state that he should no longer offer himself for re-election. He therefore begged to return the keys, which he held as Director, into the custody of the Chairman.

Mr. Hill then retired.

The Chairman said he had a few observations to make with regard to the general business of the Company. Within the last twelve months their old and venerable Chairman (Mr. Simpson) had been much failing in health, and he had felt compelled to send in his resignation. The Board could not let the occasion pass without stating how deeply indebted they had been to him in former years for the very hard work he had done in the Company, and the devotion he had shown to their interests. They knew how completely their Chairman had been bound up in the prosperity of the Company, and that it had cost him a very great effort to send in his resignation. As the report and accounts gave such full information with reference to the position of the Company, he need add nothing whatever to them. A comparison between the two half years ending December, 1878, and December, 1877, showed this result. In the half year ending December, 1877, the tons of coal used were 52,100; in 1878, they were 56,100; the cost of the coals being £37,735 in the former year, as against £39,814 in the latter. The cost per ton was 14s. 6d. in 1877, and 14s. 2d. in 1878, including cannel. The receipts for coke in 1877 were £16,395, and £16,391 in 1878. The residual products sold for £25,892 in 1877, and for £26,738 in 1878. The gas-rental, at 3s. 2d. per 1000, was £74,377 in 1877, and, in 1878, at 3s. per 1000, it was £76,588, or £2200 more, notwithstanding the reduced price.

Mr. Hobson said he wished to ask a question respecting the report that had appeared, that the Company had nearly arranged either to buy up, or to amalgamate with the Surrey Consumers Company. The Shareholders would be glad to know what steps had been taken in the matter.

The Chairman said he would read a paragraph which had been handed to him from a newspaper—the *Daily Chronicle*—giving an account of the meeting of the Surrey Consumers Company:—"The Chairman then stated that the Surrey Consumers Company had had an offer from the Chartered Gas Company; and the South Metropolitan having become aware of that, made a better offer. They were prepared to share and share alike up to 11 per cent., and then the South Metropolitan to take all the rest." He (the Chairman) thought at present they had better refrain from discussing the matter, as it was not before the meeting, and they might be quite sure that all that the Board did would be done in the interests of the Company, and that the Shareholders would be consulted before the final arrangements were made.

The resolution was then put, and unanimously agreed to.

The Deputy-Chairman moved the declaration of a dividend at the rate of 11½ per cent. per annum for the half year ending the 31st of December last. He said the prosperity of the Company appeared to progress in a very satisfactory manner. In 1877 the increase was 5½ per cent., in 1878 it was 8 per cent.; and in the present year that rate of increase was fully maintained—in fact, it was larger than last year, though that perhaps was owing to the very cold weather they had experienced. They were sometimes told that gas was not at all in favour, but he believed that it was, for whenever there was a little cold weather they were sure to find a considerable increase in the consumption. This showed that gas was used for warming purposes. One thing, among others, which had tended to increase the consumption of gas was that some persons were burning it as fuel. It would be their very great hope that in the future that would be so, and that the public would not only get good gas-fittings, but good gas-stoves, because they were far from wishing that any gas should be charged for which was not properly consumed. The provision of good fittings was a subject which had been engaging the attention of a great many persons in the gas manufacturing trade.

Mr. Roston seconded the resolution, which was unanimously adopted.

Mr. Jenkins moved—"That the Directors be and are hereby authorized, under the powers of the Company's Acts of 1869 and 1876, to raise, by the creation and issue of debenture stock, the sum of £62,500, as the Directors may think fit, and that such debenture stock shall be offered at par to the Proprietors, in the proportion of £5 debenture stock for every £40 of share capital or stock held by them respectively, and shall be issued in such modes and manners, on such conditions, and with such rights and privileges as the Directors may think fit."

Mr. May seconded the resolution. He said it was not stated what interest the debenture stock was to carry. While the Act of Parliament enabled them to receive 6 per cent. per annum on debenture stock, it did not compel the Board to issue it at 6 per cent., and he thought they would all agree that issuing it at 6 per cent. would be issuing it at a high rate of interest. A lower rate would be a fairer, and, he thought, more honourable one. There were a number of Proprietors who would not be able to take up their share of the debentures, and if those debentures were issued at a higher price than they were worth, an injustice would be done to those Shareholders. He thought the interest should not exceed 5 per cent., and at that rate they would find plenty of capitalists amongst the Shareholders who would be willing to take the whole amount.

Mr. Jenkins said the Proprietors might be quite sure that the Directors, in issuing the debenture stock, would do it upon such terms as would best forward the interests of the Company.

The resolution was then agreed to.

Mr. Knowles proposed the election of Mr. Henry Butler as a Director of the Company. Mr. Butler was well known to them by his having, on different occasions, taken part in the discussions in that room. He was a man of very good business experience, and this would be especially useful at a time like the present, when they had an amalgamation in prospect.

Mr. Riley seconded the motion, which was unanimously agreed to.

Mr. Butler, on taking his seat at the Board, said he did it with considerable pride, and would endeavour to merit the confidence so kindly placed in him.

Mr. May proposed the election of Mr. Thomas Rowland Hill as a Director. Having known Mr. Hill for many years, he had much pleasure in recommending him as a most suitable person for the office. They would all agree that it was a matter of painful interest to have to appoint a gentleman in the room of any other gentleman who had thought fit to retire; but seeing that Mr. Julian Hill had retired from the Board, it was the simple duty of the Shareholders to appoint some one else in his place. Mr. Hill had been engaged in business pursuits, and would bring an amount of knowledge and judgment to the Board which must be of great advantage to them.

Mr. Maltby seconded the resolution, which was unanimously adopted.

Mr. Rowland Hill thanked the Shareholders most cordially for the honour they had conferred upon him in electing him to a seat at the Board. It had long been his desire to assist in the direction of the Company's affairs, but hitherto his time had been so occupied that he had not the opportunity which he had now sought. His best endeavours would be at all times devoted to their service, and he hoped that, in the result, the Company would increase in prosperity.

The retiring Auditor (Mr. A. Footner) was then re-elected.

The Chairman said, with reference to one observation made by Mr. Julian Hill, he might state that Mr. Hill was informed on the 17th of March of the opposition to his re-election. The report was purposely kept back until after the Board meeting on the 24th of March, in order to give that gentleman the opportunity of withdrawing his name. The report was then read in Mr. Hill's hearing, and the question was twice asked whether any alteration should be made, to which no reply was given.

On the motion of Mr. Hobson, seconded by Sir Charles Crosley, a vote of thanks was accorded to the Chairman and Directors for the manner in which they had conducted the Company's business during the past half year.

The Chairman, in responding, said that the Board would have an opportunity of proving that they really deserved all the kind things said about them when they came to discuss the matter of amalgamation which had been referred to. In that amalgamation they would take very good care not to lose any of the advantages possessed by the Company. No doubt both Companies possessed advantages which would benefit them all. The South Metropolitan had land, while the Surrey Consumers had water—the South Metropolitan had a freehold, and the Surrey Consumers had the Thames; so that, on that equation, something could be gained for both.

Mr. Robert Jones proposed a vote of thanks to the Secretary and Engineer, and to the Officers of the Company, for their valuable services during the past year.

The resolution was agreed to.

Mr. Livesey said he could assure the Shareholders that it was a great satisfaction on the part of himself and his brother Officers of that Company to receive such a cordial vote of thanks from the Shareholders. The South Metropolitan had had the lead amongst the Gas Companies of London for a number of years, and their best efforts would be devoted to its maintenance. They could not stand still. If the consumers would stop where they are, and not ask for more gas, then the Company might content itself on the canal in the Old Kent Road, and go on dividing 11½ per cent. in perpetuity; but the consumers were demanding more gas every year, and that prevented them from standing still. They must move, for if they did not so move, others would. If they did not take advantage of the opportunities that offered, there were others ready to step in and take them from them. He, therefore, believed they were doing right in the amalgamation about to be carried out—that the prosperity of the South Metropolitan would not merely be maintained, but increased—that the interests of the Surrey Consumers Company would be improved, and that these mutual advantages would enable the united Company to serve the public better than either Company could do standing alone.

On the motion of Mr. Hobson, seconded by Mr. Bennett, it was re-

solved—"That this meeting cannot separate without expressing its deep sense of the services rendered by Mr. Simpson, the late Chairman of the Company, and that a copy of the resolution be sent to him."

The proceedings then terminated.

## THE TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Works, Willoughby Lane, Tottenham, on Saturday, the 5th inst.—JAMES BRICKWELL, Esq., in the chair.

The SECRETARY (Mr. J. Randall) having read the notice convening the meeting, the following report and statement of accounts were submitted:—

The Directors have pleasure in reporting that the affairs of the Company continue to make satisfactory progress, as the accounts herewith annexed will show.

The balance of net profit is £5306 11s. 4d., from which the Directors recommend that a dividend for the half year at the rate of 10 per cent. per annum be paid on the original share capital, and 7 per cent. on the new ordinary capital, which will absorb £3401 0s. 8d. A further sum of £968 17s. has been added to the reserve-fund, which now amounts to £3000, invested in Three per Cent. Consols.

The undivided balance, proposed to be carried to the next account, is £936 13s. 8d.

The unappropriated land which the Company have the power to use for manufacturing purposes being very limited, the Directors have considered it prudent to purchase a piece of land opposite the entrance to the works, and believe it will prove greatly to the Company's advantage.

*DR.—Revenue Account for the Half Year ended Dec. 31, 1878.*

| | | | |
|---|---|---|---|
| **To Manufacture of gas—** | | | |
| Coals, including carriage, unloading, &c., on works | £5,874 5 7 | | |
| Purifying material, oil, and sundries at works | 223 8 1 | | |
| Salary of Engineer | 175 0 0 | | |
| Wages and gratuities at works | 1,135 12 4 | | |
| Repairs and maintenance of works and plant, including renewal of retorts, apparatus, tools, material, and labour | 1,752 3 5 | | |
| | £9,160 9 5 | | |
| Less old material sold | 32 2 6 | | |
| | | £9,128 | 6 11 |
| **Distribution—** | | | |
| Salaries of Inspectors and Clerk | £150 10 0 | | |
| Repairs and maintenance of mains and service-pipes, including material and labour | 627 14 8 | | |
| Repairing, renewing, and fixing meters | 113 6 6 | | |
| | | 891 | 11 2 |
| **Public lamps—** | | | |
| Lighting and repairs | | 254 | 0 10 |
| **Rents, rates, and taxes—** | | | |
| Rent of siding | £27 10 0 | | |
| Rates and taxes | 635 14 4 | | |
| | | 663 | 4 4 |
| **Management—** | | | |
| Directors allowances | £375 0 0 | | |
| Salaries—Secretary and Clerks | 230 0 0 | | |
| Collector's commission | 128 16 10 | | |
| Stationery and printing | 39 18 4 | | |
| General establishment charges and incidentals | 129 16 5 | | |
| | | 903 | 11 7 |
| Auditors | | 35 | 0 0 |
| Law charges | | 8 | 1 5 |
| Interest on deposits for gas | | 6 | 14 10 |
| Bad debts | | 367 | 11 3 |
| Total expenditure | | £12,258 | 2 4 |
| Balance carried to profit and loss account | | 5,034 | 8 4 |
| | | £17,292 | 10 8 |

*CR.—Revenue Account.*

| | | | |
|---|---|---|---|
| **By Sale of gas—** | | | |
| 58,693,700 cubic feet, at 4s. 3d. per 1000, less discounts | £12,418 17 2 | | |
| Public lighting and under contract | 1,195 0 0 | | |
| | £13,613 17 2 | | |
| Rental of meters | 411 3 0 | | |
| | | £14,025 | 0 2 |
| **Residual products—** | | | |
| Coke, less £180 8s. 5d. labour and cartage | £2021 19 2 | | |
| Breeze | 84 14 6 | | |
| Tar | 549 4 7 | | |
| Ammonia and liquor, less £200 2s. 1d. for acid | 561 5 4 | | |
| | | 3,217 | 3 7 |
| Lamp columns and fittings | | 49 | 9 5 |
| Transfer fees | | 0 | 17 6 |
| | | £17,292 | 10 8 |

The CHAIRMAN, in moving the adoption of the report, congratulated the Shareholders on the present position of the Company. The increase in the sale of gas over the corresponding half year was £1676 12s. 3d., and the increase in the sale of coke over the same period was £242 8s. 9d. The amount paid for coal was £331 10s. more than in the corresponding half of last year. For every pound spent in coal, there had been a return of £2 7s. 9d. for gas, while in the corresponding period last year it was £2 4s. 9d. This, he thought, was as good a production as many companies could boast of. The gas-rental had increased nearly 17 per cent. It was satisfactory to see that although the outlay for coals had been greater by about £300 during the half year, something like £1700 had been obtained for gas from the extra outlay. Of the residual products, not much could be said, because, unfortunately, coke had been a drug in the market. There was then increased difficulty in getting rid of it; so much so, that the price realized was very little more than half what had been obtained some few years ago. The other residuals were much in the same condition as they had hitherto been. Although the sale of tar and ammonia had somewhat increased, still there had been a slight lull even with these. However, there was nothing unsatisfactory about them. There was in the accounts an item for public lamps, amounting to £254. It was a satisfaction to find the Company had lately thought it prudent to reduce the price charged for the public lamp-columns. The consequence had been that it had given great satisfaction to the parishes, and they had issued instructions for a very large number of additional lamps to be erected. He had no doubt, therefore, that, even with the low price charged, these new lamps would be equally productive as regards profits to the Company. It was expected that about 250 lamps were to be erected in Edmonton. He regretted to say that the rates and taxes had greatly increased; the assessment of last year had been very largely in excess of what it had hitherto been. The half year's taxes amounted to a larger sum than that originally paid—namely, £635, which was a very large item for a Company like theirs. In the matter of law charges there was nothing to complain of, as only £8 had been expended; but that sum did not include the charges for the conveyance of new land. The only really disagreeable item was that of £367 under the head of "bad debts;" but this ought properly to be called a "bad debt," because the larger proportion of it was attributable to one speciality, only £26 really relating to gas. Therefore, as regarded the bad debts incurred in the sale of gas, they were very small indeed. The Company had been unfortunate enough to incur a bad debt of £337 16s. 3d. from the sale of some sulphate of ammonia to a contractor, who had removed it from the premises, rather contrary to the usual habit; but he had always paid so well that the Company were taken somewhat by surprise, and allowed him to carry it away without first paying cash, which was the general rule. Unfortunately, after the purchase of the ammonia, the contractor suddenly became overwhelmed with difficulties, and only £50 had been recovered.

Mr. DRAPER said he was afraid it was a very bad debt, because, on the other side, there was only 1s. 10d. recovered.

The CHAIRMAN said that that was not on account of the debt in question, although it was in the same category. That 1s. 10d. was received as composition for a bankruptcy debt, the whole of which was written off in the former half year, and the 1s. 10d. had been carried to the good.

Mr. DRAPER said he was sorry to see the amount of bad debts, because it was five times that contained in the last half-yearly statement. He thought the bad debts last half year amounted to only £66 8s. 5d. on gas alone.

The CHAIRMAN said that there was no single bad debt of any considerable amount, and that the sum mentioned was composed of a number of small debts incurred by defaulters for rental. Although no mention was made in the report as to the matter of new capital, it was not unlikely, from the large demand made upon the Company for an increased supply of gas, that it would be rendered absolutely necessary to extend some of the manufacturing plant and mains. This would lead the Directors to ask the assistance of the Shareholders to enable them to pay for the goods when they were obtained. Although he could not pledge himself as to the precise date when the money would be required, he believed the Proprietors might anticipate a call being made upon the new ordinary capital, of £2 per share, on or about the 1st of October next, and a further call of £2 per share at the beginning of the year 1880. He had great pleasure in moving—"That the report and accounts now read be received, adopted, and entered on the minutes of this day."

Mr. R. J. LAING said he had much pleasure in seconding the motion. In reference to the item of the bad debts on ammonia, the increase in the half year had been £561, against £317 for the whole of last year. He presumed that was upon the new contract altogether.

The CHAIRMAN explained that in consequence of the transitory state of certain parts of the works, ammonia had not been manufactured until a late period, and instead of manufacturing sulphate, which the larger increase had arisen from, the liquor was being sold at the lower price.

Mr. R. J. LAING asked if the increase of £254 in lighting and repairs, against £459 in the previous year, was owing to the increase in the number of lamps.

The SECRETARY said that if the one half year was compared with the other, the amount would be found to be £231 0s. 2d., so that the items were in about the same ratio.

Mr. BELLINGHAM asked how the £2000 had been invested.

The CHAIRMAN pointed out that the report stated that "a further sum of £968 17s. has been added to the reserve-fund, which now amounts to £3000, invested in Three per Cent. Consols." Adding £31 3s. to the £968 17s., there was an exact total of £1000. The £31 3s. arose from the accumulated dividends on the £2000; by adding to it the £968 17s., it made another £1000, which had been invested since the accounts were made up and audited.

The resolution was then put and carried unanimously.

The CHAIRMAN then moved—"That a dividend at the rate of 10 per cent. per annum on the original capital, and 7 per cent. per annum on the new ordinary capital, for the half year ending Dec. 31, 1878, as recommended by the Board in their report, be now declared."

Mr. WILLIAM SMITH seconded the motion, which was carried.

Mr. A. D. SMITH said it would be remembered that it was suggested at the meeting a year ago that the salaries of the officers should be increased. Seeing that they bore the burden and heat of the day, and seeing especially that a further extension of the works was in contemplation, he asked whether the time had not arrived when the salaries of the Secretary and Manager should not be somewhat increased. He thought it was about two years ago that some addition was made to the salary of the Directors, and this time last year the amount paid to the Auditors had been increased, and it struck him that the time had now come when those officials who had so ably done their duty, and so zealously assisted in the work of the Directors, should have additional remuneration. Comparing the returns with the profits of the income on gas for the year 1876 up to the present time, he thought it would be found that the income had increased one-third. Of course this could not be done without additional work being imposed on the Secretary on the one hand, and the Manager on the other; but, on looking at the Act, he observed that the matter rested with the Directors.

The CHAIRMAN pointed out that the question of salaries could not be entertained at that meeting. Mr. Smith, however, might give any notice of motion he pleased on the subject. Two years ago an addition of £25 was made to the Secretary's salary; but the Shareholders had only to convey their wishes to the Board, and they could rest assured that the matter would be seriously considered. Nothing would be lost by allowing the matter to stand over.

Mr. A. D. SMITH said that lately there had been a great "scare" as to the effect of the electric light upon gas companies, and he had heard that one or two companies had, in consequence, resolved to facilitate an increase in the consumption of gas in other ways than for lighting. He was not sure that The Gaslight and Coke Company had not done this by contemplating the manufacture of cooking-stoves, and supplying them to the poorer classes. He thought this was a subject which might be worthy the consideration of the Directors, seeing that they were about to enlarge their works.

The CHAIRMAN said that the majority of the companies who had, in the Bills they had brought before Parliament this year, inserted clauses asking for power to manufacture such articles, with the view of increasing the consumption of gas, had withdrawn those clauses, notwithstanding that many of them had previously possessed that power. Although the matter had been referred to a Select Committee of the House of Commons, he believed the difficulties would be so great in dealing with the subject—it not being ripe for the kind of argument necessary for the Committee—that the companies would be glad to withdraw it.

Mr. BELLINGHAM gave notice that in September next he would call attention to the Secretary's salary, and he hoped that, in the meantime, the Directors would also take into consideration the emoluments received by the Manager. He thought this was a subject worthy of consideration.

Major CARTWRIGHT also thought that the matter should come up for consideration next October. Mr. Randall had given them 28 years of service, and looking to the extensions that had been made in the works, and also to the prosperity of the Company, he (Major Cartwright) thought the Secretary's salary ought to be £500 a year.

Mr. BELLINGHAM said that his notice of motion would be—"That at the next annual general meeting the salary of the Secretary be taken into consideration."

Mr. BELLINGHAM then moved, and Major CARTWRIGHT seconded, a vote of thanks to the Directors and Officers of the Company, which was carried unanimously.

The Chairman, in returning thanks, said the Directors had endeavoured to do their utmost for the advantage of the Company, and he trusted that there would be no lack of energy on their part. As regarded the Officers, the Directors had greater opportunity of testifying to their abilities than the Shareholders had. Speaking of the Secretary and the Manager, the Proprietors ought to be proud of having such men, seeing that they were so thoroughly up to their business, and employed their time so well to the Company's advantage.

The Secretary (Mr. Randall), in reply, said he was thankful to the meeting for the confidence they reposed in him. It had always been his constant endeavour to do his duty, and he trusted that it would always be so.

The Manager (Mr. Broadbury), in returning thanks for the vote so cordially passed to him, expressed a hope that the future might be as prosperous as the past, and the Proprietors might rely upon his best efforts being always used to promote the interests of the Company.

The usual vote of thanks was then accorded to the Chairman, and the proceedings terminated.

## SHEFFIELD UNITED GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Thursday, the 3rd inst.—Mr. F. T. Mappin in the chair.

The following report and accounts were submitted:—

Notwithstanding the reduction in the Company's charge for gas, announced in the report presented to the general meeting in October last, and which reduction came into operation on July 1, 1878, your Board are gratified in being able to present accounts which show that during the past half year the Company's operations have resulted in a profit more than sufficient to pay the maximum dividends allowed by the Company's Act, by the sum of £2916 0s. 8d. This is shown by the following figures:—

| | | | |
|---|---|---|---|
| The profit for the half year (excluding £14,817 17s. 11d., carried over from the one preceding it) was | | | £28,646 5 6 |
| The maximum dividends are as under:— | | | |
| Dividend on £135,000 class A stock, after the rate of 10 per cent. per annum | £6,750 0 0 | | |
| Dividend on £209,053 10s. class B stock, after the rate of 10 per cent. per annum | 10,452 13 6 | | |
| Dividend on £99,700 class C stock, after the rate of 10 per cent. per annum | 4,085 0 0 | | |
| Dividend on 12,937 new ordinary £10 shares (second issue), £4 per share paid up, after the rate of 10 per cent. per annum, being 4s. per share, or | 2,587 8 0 | | |
| Dividend on 11,462 E shares of £8 10s. each, of which £2 per share was, on the 1st of August last, paid, being after the rate of 10 per cent. per annum, or 1s. 8d. per share | 955 3 4 | | |
| | | 25,730 4 10 | |
| Surplus | | | £2,916 0 8 |

The accounts also show that, after paying the above dividend, there will remain to the credit of revenue the sum of £17,733 18s. 7d. to carry forward to the credit of the half year now current.

The reserve-fund amounts to £61,950 15s. 6d.

Your Board are about to enlarge the Effingham Street works, and to put up a new gasholder there, capable of holding 1,280,000 cubic feet of gas. Tenders have been already made for the tank required for this purpose.

The satisfactory result of the Company's operations for the past half year—which, of course, was only ascertained on the completion, within the last week or two, of the accounts now presented—has justified your Board in making a further reduction in the Company's charge for gas of 1d. per 1000 cubic feet, to take effect from the 1st of July next, which will make the price charged for the public lamps 2s. 2d. per 1000 cubic feet.

You will naturally expect your Directors not to close the report without making some allusion to the electric light. That subject has, since the last Shareholders meeting, not only had the constant and careful consideration of your Board and the Company's Manager, but also of a Committee of Directors, specially appointed to investigate the matter in all its bearings. Without going into details, your Board feel warranted in assuring you of their conviction that although the electric light may, for certain special purposes, and in certain places, be substituted for gas, it will never, for general use, supersede it.

The inhabitants of Sheffield had, a short time since, the opportunity of seeing the electric light in operation for street lighting, it having been, for a few evenings, used at the public lamp opposite the top of the Fitzalan Market Hall.

Your Directors, in order to show the efficiency of gas for public lighting, are about (with the consent of the Corporation, which has been obtained) putting up Sugg's new burners in the following localities, viz.:—The Junction of Waingate, Castle Street, Castle Folds, and the Haymarket; the bottom and top of King Street; the corner of the Post-Office; on the outside of the Fitzalan Market, opposite to Market Street; and above the public lamp now standing opposite the top of the Fitzalan Market, where the electric light was exhibited. Your Board feel satisfied that they will thereby establish the fact that streets can be lighted by gas as efficiently as by the electric light, and at much less cost.

Dr. *Capital Account, for the Half Year ending Dec. 31, 1878.* Cr.

| | | | |
|---|---|---|---|
| Class A stock, fully paid up | £135,000 0 0 | Land, buildings, parliamentary, and other expenses, works, and machinery (including mains to June 30, 1855) | £429,230 11 0½ |
| Ditto B do. do. | 209,053 10 0 | Mains from June 30, 1855 | 75,359 4 5 |
| Ditto C do. do. | 99,700 0 0 | Meters | 30,832 12 7 |
| 12,937 new ordinary £10 shares (2nd issue), £4 per share paid up | 51,748 0 0 | Balance | 7,603 1 11½ |
| 11,462 E £8 10s. shares, created May 6, 1878, £2 per share paid up | 22,924 0 0 | | |
| Amount raised on mortgage | 24,800 0 0 | | |
| | £543,225 10 0 | | £543,225 10 0 |

*Revenue Account.*

| | | | |
|---|---|---|---|
| Balance brought from last account | £14,817 17 11 | Half year's expenditure in the production of gas | £57,959 2 5 |
| Half year's gas and meter rents, due Dec. 31, 1878 | 62,411 14 7 | Paid mortgagees & bankers for interest during the half year | 211 6 9 |
| Amount arising from the sale of coke, tar, waste lime, and ammonia water | 19,193 8 4½ | Balance | 43,464 3 5 |
| Amount realized from the manufacture of sulphate of ammonia, sale of gas-fittings, and work done (after deducting all charges) and house and other rents | 5,211 11 6½ | | |
| | £101,634 12 7 | | £101,634 12 7 |
| Balance brought down | £43,464 3 5 | Dividends payable April 9, 1879 | £25,730 4 10 |
| | | Balance to be carried forward | 17,733 18 7 |
| | | | £43,464 3 5 |

Maximum price of gas for the half year, 2s. 7d. per 1000 feet.

*General Balance.*

| | | | |
|---|---|---|---|
| Balance of revenue account | £43,464 3 5 | Ledger balances, and accounts owing to the Company | £58,392 16 6 |
| Ledger balances, and accounts owing by the Company | 51,663 11 0½ | Stores in hand | 16,714 13 8 |
| Balance of capital account | 7,603 1 11½ | Balance due from Bankers | 27,621 14 7 |
| | | Balance due from Cashier | 1 11 8 |
| | £102,730 16 5 | | £102,730 16 5 |
| Reserve-fund, invested June 30, 1878 | £53,027 0 1 | | |
| Amount transferred from revenue, Oct. 9, 1878 | 6,930 17 9 | | |
| Interest to Dec. 30, 1878 | 1,092 17 8 | | |
| | £61,950 15 6 | | |

The Chairman, in moving the adoption of the report and accounts, said only one opinion could be entertained respecting them, and that was that they must be satisfactory alike to the Shareholders and to the Directors. After reducing the price of gas 2d. per 1000 feet, making the highest price 2s. 7d. and the lowest 2s. 3d., they had a net profit of £28,646 5s. 6d., and so were enabled to pay the full dividend of 10 per cent. upon all the paid-up shares and stock of the Company, amounting to £25,730 4s. 10d., and carry forward a balance for the current half year of £2916 0s. 8d., making, with former balances, the large sum of £17,733 18s. 7d. to be carried forward, whilst there was now a handsome surplus fund of £61,950 15s. 6d. This had been earned in various ways by the Company. There had been a less expenditure upon retorts of £1409, and the rates and taxes paid had also been considerably less, chiefly in consequence of the different mode of collection adopted. The interest on mortgage had been greater, and the Company had received more for meter-rents by £307, more for coke by £541, and more for tar and ammonia water by £351, as well as other amounts on the favourable side. On the contrary side, they had received less for gas by £1667, which was not such a great decrease as the Directors anticipated by the reduction of 2d. per 1000 in the price last July. They had paid more for coals—not actually in the price, but in the quantity used—and they had paid more for oxide and wages, and some other matters, leaving, however, a net profit of £28,646 5s. 6d. Last year they completed at Neepsend the new gasholder capable of holding 1,080,000 cubic feet of gas, and the Board then considered they had made ample provision for storeage room, at all events for the present; but, in consequence of the unusually dark weather that had prevailed in the winter, continuing sometimes four, five, or six days, the Company were placed in a position neither comfortable nor satisfactory, and on one or two occasions he was sorry to say they were compelled to reduce the pressure to spin out the supply. [The Manager here made a communication to the Chairman.] Mr. Roberts told him that he had made a mistake on that matter. He was glad to hear such was the case, and he would not argue the point with him. However, to obviate any anxiety on the subject, the Shareholders would notice that the report stated they were going to construct a large gasholder in Effingham Street, capable of holding 1,280,000 cubic feet of gas, by which means they could do away with three smaller holders capable of holding 390,000 cubic feet. This would entail considerable expense; but so much as they had paid for making these three gasholders they should charge to revenue, and the balance to capital, after deducting the cost. The Directors had decided to reduce the price of gas, after the present half year, 1d. per 1000 feet. He was sorry they did not see their way to do more than that. They had had several matters placed before them that had operated on some of their minds—such, for instance, as the repairs necessary upon the chimneys at Neepsend, and the shed which had to be renewed, as well as the gasholder to which he had previously referred. A good portion of the money required for these purposes would have to come out of revenue; and they might also look upon it that they had arrived at pretty nearly the lowest price at which they could buy coal. He did not say this positively, but it seemed very much like it, and he did not think the coalowners would be disposed to sell at a less price than at present. Residuals were also at a lower figure than they had been. This was caused by the peculiar winter we had had, which had necessitated a greater consumption of gas throughout the country, and placed in the market a large quantity of residuals, the result being to bring down the price. However, he believed that was only temporary. There was another matter touched upon in the report—the subject of the electric light. They had all read a great deal about that light, and many of them had seen what it was capable of doing. There were one or two references that might, however, be interesting to the Shareholders. Perhaps the most important report was that presented by M. Cernesson, on the part of the Lighting Committee, to the Municipal Council of Paris. A French Company, which had been formed to work the electric light, offered to the Paris Municipality to light a number of streets for three years on the Jablochkoff system. Before the offer was accepted, the Municipal Council asked the Engineer of the Electric Light Company to meet the representative of the Paris Gas Company and their own Engineer. These gentlemen met, and the report signed by M. Cernesson embodied their opinions on the subject. In the first place, the report spoke of the sudden extinctions to which the electric light was liable, and the three gentlemen did not think it likely that these extinctions could be obviated. The experiments in the Avenue de l'Opéra showed that 66 interruptions in the supply of the light took place from May 30 to Oct. 10 last year, and these interruptions lasted for periods varying from 3, 5, 10, 15, 30, 35, and as much as 45 minutes at a time. Generally four lamps were extinguished at a time, and sometimes as many as 14 and 16 went out; therefore, it necessitated some one to be always present to keep them in order. This was a very serious matter, and there were no means at present to prevent these stoppages. The Electric Light Company had, however, offered to supply with their light nine streets, to be provided with 171 lights, and the Municipality of Paris had agreed to accept the offer at a great modification in price. They were going to pay £8507 for the experiment, whereas, if they used gas at the present Paris price, the cost would be £1373, so that the extra cost of electric lighting would be very great—in fact, the City would have to pay £7133 for the experiment, beyond the price of gas. After having expended £24,000 for the six months previous, he thought the Parisians were a very courageous people in again deciding to use the electric light, for he felt assured no municipal body in England would have ventured on such a responsible experiment. The experiment in electric lighting on the Holborn Viaduct in London had come to an end. It had cost £3072 for the year, whereas the cost of gas would only be £419; so that the City Authorities, considering the ratepayers pockets, had every reason to return to the use of gas. Every member of the Board, as well as himself, agreed that it would be unwise to offer any definite opinion on the price of gas shares on a previous occasion. It was a matter of great doubt in the minds of many what the result would be, yet none of them lost faith in the value of gas property, and he thought he might say that the Shareholders did not lose faith in the property they held. He did not think it was possible for any company, with so large a capital, to have so few transfers as the Sheffield Gas Company during the late scare. They might possibly have heard of Mr. Hawksley, the celebrated gas engineer. That gentleman had such confidence in gas shares, that all the money he was able to raise was invested in those shares, and the amount he realized during the late scare was very large. It would be noticed from the report that the Company were about to show the people of Sheffield what gas was really capable of doing, if they were only prepared to pay an increased price for it in the way of a larger consumption. Next week the Board hoped that they would succeed in showing the town what gas could do at a moderately increased expenditure. It was their intention to put up some of Mr. Sugg's new burners at the junction of Waingate, at the corner of the Post Office in King Street, and outside the Fitzalan Market. Before the burners were used they were being carefully and minutely tested, and the Directors would be able to see exactly the amount of gas consumed, and learn whether the Authorities would have the more important thoroughfares of the town lighted by these lamps. He was desired by the Officers of the Company to mention one fact in reference to an improvement in the consumption of gas. It was a simple

one, and was this, that the larger openings of the chimneys and globes added greatly to the light, by causing better combustion of the gas, enabling consumers to use bat's-wing burners, and, for the same price, obtain a better light. Those who had given attention to the subject, knew how important it was to adopt this improvement, and also to see that their burners were renewed, say, once a year. Their undertaking was in a most satisfactory condition, and, looking forward to its increased prosperity, he had great pleasure in moving the adoption of the report.

Mr. B. CARTLEDGE seconded the motion, and, speaking of gas as superior to the electric light for ordinary lighting purposes, affirmed that he had no anxiety as to his own property in the Company.

In answer to Mr. J. WILSON,

The CHAIRMAN stated that negotiations were pending with the Duke of Norfolk to take a considerable portion of the Shude Hill property, and that they were endeavouring to make their works in Effingham Street freehold. At present they were only leasehold; but, having expended a large sum of money there, they thought it desirable to negotiate with his Grace to make them freehold. The Chairman then moved—"That the following dividends—namely, 5 per cent. on the class A, B, and C stocks, 4s. per share on the new ordinary £10 shares, and 1s. 8d. per share on the E shares, be now declared for the half year ending Dec. 31, 1878, and that the same dividends be payable on Wednesday, the 9th day of April inst."

The motion was seconded by Mr. J. GREEN, and carried.

The proceedings then terminated.

## SHEFFIELD WATER-WORKS COMPANY.

The Annual Meeting of the Shareholders of this Company was held on Monday, the 7th inst.—Mr. W. COCKAYNE, Chairman of the Board of Directors, presiding.

Mr. B. SMITH (the Law Clerk) having read the advertisement convening the meeting, the following report was submitted:—

The Shareholders will recollect that, on the 21st of October last, an extraordinary general meeting of the Company was held, for the purpose of dealing with the revenue of the Company for the years 1876 and 1877, for which no dividend had been declared, for the reasons explained in the circular issued by the Directors preparatory to that meeting. At that meeting the Shareholders resolved that a dividend, after the rate of 1 per cent. per annum, should be made for the two years, and that the sum of £15,649 2s. 1d., which would, after the payment of such dividend, remain of the balance of income for those years, should be carried forward as undivided income.

The gross income received during the year 1878 amounted to £68,095 2s. 11d., showing an increase over the receipts of the previous year of £3326 9s., principally attributable to an increase in the amount received for water-rates to the extent of £1840 6s. 4d. The expenses of the Company, the interest on its debenture debt, and the dividends on the whole of the preference shares, the details of which appear in the accounts, amount in the aggregate to the sum of £67,094 1s. 11d., being £1001 1s. less than the income received for the year. The interest on debentures, and the dividends on preference shares, however, include the interest payable during the year on the capital invested in the Damflask reservoir and its dependent works, and in land purchased and agreed to be purchased for the future works on the Ewden; such interest being necessarily paid in the first instance out of the Company's revenue. The Court of Chancery determined that this interest ought, until the Damflask reservoir, and the future works are, in the opinion of the Company's Engineer, fit to be filled with water, and to be used for the purposes of the Company, to be a charge on the capital and not on the income of the Company. Mr. Hawksley, the Company's Engineer-in-Chief, is of opinion that the Damflask reservoir, having earthworks of an extremely heavy character, has not yet sufficiently consolidated to justify its being filled and used, and the future works on the Ewden have not yet been commenced.

The before-mentioned charges on the gross revenue of the Company for the past year are consequently decreased by the transfer to capital, in accordance with the direction of the Court of Chancery, of the sum of £13,053 4s. 9d., the interest for the past year on the capital invested in the works at Damflask, and the land for those intended on the Ewden. After this adjustment, the net balance of income for the year 1878 is the sum of £14,059 5s. 9d., out of which there has been paid on the 17th of December last an intermediate dividend after the rate of 2 per cent. per annum, amounting to £4618 10s. for the half year ending June 30, 1878, on the ordinary shares of the Company, leaving the sum of £9440 15s. 9d., which, added to the sum of £15,649 2s. 1d., the balance of undivided income brought forward from the year 1877, makes the sum of £25,089 17s. 10d., which is the amount of revenue to be dealt with by the Shareholders on the present occasion. The Directors recommend that out of this sum £4618 10s. should be applied to a dividend on the ordinary shares, after the rate of 2 per cent. per annum, payable on the 1st of May next, for the half year ending the 31st of December last, and that the balance which will remain, being the sum of £20,471 7s. 10d., shall be carried forward as undivided income.

The Directors consider that it is a matter for congratulation to the Shareholders that, notwithstanding the great commercial depression which existed during the past year in Sheffield, the Company's income from water-rates has increased by so substantial a sum as £1840, and they regard this fact as the best possible evidence that when good trade again returns to the district, the large outlay made by the Company in the extension of its works, will not only have secured to the population, increased as it doubtless will be by commercial prosperity, the great benefit of an abundant supply of excellent water, but will afford to the Shareholders a satisfactory return for their investment. The Directors have reason to believe that the value for manufacturing purposes of the water supplied by the Company has not been hitherto sufficiently appreciated by the manufacturers of Sheffield, many of whom are probably not aware of the peculiar fitness for mechanical purposes which, owing to its softness and purity, it possesses.

The completion of the Company's works on the Loxley has placed the safety of the general supply of water of the town beyond any doubt; the Directors have, therefore, come to the conclusion that the time has arrived when, in order to stimulate the demand for water for trade purposes, a reduction in price may be made in cases where large quantities are taken. They have, therefore, with the assistance of the Company's Engineers, prepared a new scale of charges for water sold by measure, under which a considerable reduction has been made in the price of water, where quantities exceeding 20 million gallons may be taken in one year. The Directors have every reason to believe that this reduction will encourage the greater use of the Company's water for trade purposes, and thus prove beneficial to the Company by increasing its resources, and to the public by the more general introduction of the water to the knowledge of the manufacturers of Sheffield.

In the course of the past year, an agreement was made with the Sanitary Authority of Chapeltown for the sale of water to that body, for the supply of their district. Some delay occurred in the settlement of this agreement, but it was finally concluded, with the sanction of the Local Government Board, on the terms originally proposed by the Company. The pipes for the conveyance of the water to Chapeltown are now being laid. The extension of the Company's pipes to Dore was completed within the period limited by the agreement made with the landowners who contributed to the cost, and who, thereupon, paid to the Company the sum of £3300, which they had guaranteed. The demand for water has not yet arisen in Dore, but the Directors see no reason to change the opinion expressed in their last report, that the extensions, to both Chapeltown and Dore, will prove remunerative, and they are confirmed in the view expressed in that report, that those cases were the first instances of a demand certain to rapidly increase, by the fact that the Directors have now under consideration applications for a supply of water from other places outside the boundaries of the district originally assigned to the Company.

Since the sale by auction, mentioned in the last report of the Directors, all the land at Crookes Moor, then offered for sale, except that advertised as lot 1, has been sold, at prices which, with the £2175 produced by the two lots sold by auction, amount to £20,312 11s. 1d. The site of Limerick Wheel and the adjoining land remain unsold, and the Company still possess, at Crookes Moor, in addition to the land advertised as lot 1, ground-rents amounting to £106 1s. per annum. The Directors consider that, if proper prices can be obtained for these three properties, it will be advantageous to the Company to dispose of them. They have made endeavours to do so by private contract, which, with respect to a great part of the ground-rents, they believe will be successful; and they propose to sell the whole of those ground rents, the land advertised as lot 1, and the Limerick Wheel property, should they be able to obtain the prices which they are advised those properties ought respectively to produce.

The Directors greatly regret the death of Mr. William Sissons, who had for several years been a member of the Board, and bestowed great attention to the business of the Company. Mr. Henry Jubb, of Moorgate House, Rotherham, was elected to fill the vacancy in the directorship caused by the death of Mr. Sissons, and accepted the appointment.

The Company's Engineer reports as follows:—

"30, *Great George Street, Westminster, S.W., March* 12, 1879.

"Gentlemen,—I have the honour to report that I have made my annual inspection of the impounding reservoirs of the Company, with the following results:—(1) The three Redmires reservoirs.—These reservoirs are in perfect condition in every respect. (2) The three Rivelin reservoirs.—These reservoirs are also in excellent order, nothing being required beyond a slight staunching at the weir of the upper reservoir. (3) The four Loxley reservoirs.—The Strines reservoir is in perfect order. The Dale Dyke reservoir (filled, but not yet used) is also in good general condition, with the exception of the usual effects (easily rectified) of the natural compression of the new embankment. The Agden reservoir is also in a satisfactory state. The Damflask reservoir, being the latest made, and having earthworks of an extremely heavy character, has not yet perfectly consolidated; I, therefore, recommend that the filling be, for the present, deferred. The quantity of water now in stock is sufficient for the supply of the town and mills for the next eight or nine months, without any accession from rainfall or springs.—I am, gentlemen, your most obedient servant,

"T. HAWKSLEY."

The outgoing Board is composed of the following gentlemen:—Mr. William Cockayne, Mr. John William Hawksley, Mr. Henry Crookes, Mr. Thomas Cole, Mr. Francis William Colley, Mr. William Isaac Greaves, Mr. Percy Smith, Mr. Samuel Roberts, the younger, and Mr. Henry Jubb, all of whom are eligible, and offer themselves for re-election.

The CHAIRMAN moved, and Mr. HAWKSLEY seconded, a motion for the adoption of the report.

Mr. G. HIDES said before the motion was put to the meeting he should like to ask a question in relation to the laying of the mains to Chapeltown. He had hoped the Chairman would have supplemented the report issued to the Shareholders by a few general remarks about the well-being and the future prospects of the Company. The question he wished to ask was, how soon, in all probability, would the works to Chapeltown be completed; and he would also like to know what was the probable result of laying the mains to Dore, for he believed they had now been in operation some six or eight months.

The CHAIRMAN said the Chapeltown mains would be completed in about three months, if the work went on pretty well; but with regard to Dore he could not then state the result.

Mr. HIDES asked if the Company fell actually into the receipt of revenue as soon as the work of laying the Chapeltown mains was completed.

Mr. ASHTON (General Manager) replied that the income would begin as soon as the mains were charged with water.

Mr. PERCY SMITH, in reply to Mr. Hides, said the Chairman did not quite grasp the question relative to the Chapeltown mains, but Mr. Hides would find it fully answered in the report. He would find it there stated that "in the course of the past year an agreement was made with the Sanitary Authority of Chapeltown for the sale of water to that body, for the supply of their district. Some delay occurred in the settlement of this agreement, but it was finally concluded, with the sanction of the Local Government Board, on the terms originally proposed by the Company. The pipes for the conveyance of the water to Chapeltown are now being laid." With regard to the extension of pipes to Dore, he would find that also dealt with in the report. It said: "The extension of the Company's pipes to Dore was completed within the period limited by the agreement made with the landowners who contributed to the cost, and who thereupon paid to the Company the sum of £3300, which they had guaranteed. The demand for water has not yet arisen in Dore, but the Directors see no reason to change the opinion expressed in their last report, that the extensions to both Chapeltown and Dore will prove remunerative, and they are confirmed in the view expressed in that report that those cases were the first instances of a demand certain to rapidly increase, by the fact that the Directors have now under consideration applications for a supply of water from other places outside the boundaries of the district originally assigned to the Company." He did not know that Mr. Hides could have a more ample answer than that which was contained in the report itself.

Mr. HIDES said he was under the impression that the mains to Chapeltown would not be completed under twelve months; but now he had the answer that they would be completed in three months, and that was a piece of valuable information. He thought it quite possible there was other information the Directors might have before them, and that was as to whether the Company would fall into receipts as soon as the works were completed. He had it on his mind that an arrangement had been made with Chapeltown that they should pay a certain price for the water, and that they should pay for not less than so much as soon as the water was supplied. He might be wrong; but he should be glad to have authoritative information from the Board.

Mr. F. E. SMITH said from the accounts he noticed that the Directors had spent during the past year something over £60,000 on capital account, and they congratulated the Shareholders on an increase from water-rates of £1840. He wished to know how they could expect the small sum of £1840 to pay the interest on the large increase of £60,000 on capital account. He had understood the capital account was practically closed, and yet he found that the Company had spent £60,000 additional during the past year. He should like to know on what that amount of capital had been spent. He noticed that £20,300 had been realized from the sale of the Crookesmoor land, but the accounts did not show what had been paid for advertising, surveying, solicitors, and engineering charges in connection with the transaction. They were told two or three years ago by Mr. Colley that it almost took his breath away to think of the surplus land the Company had in their possession, and the immense value of it; but now they came to realize, and had realized only £20,000, he thought that was a very small amount, and did not seem commensurate with the value of the land. Another thing mentioned in the report was the supply of water to Dore. It was, he contended, a very good thing to supply water wherever it was required, if they could get a return; but according to the Directors themselves, they did not see any customers for it at Dore. He wanted to know whether the Duke of Devonshire, who specially wished the water to be laid to Dore, had given them guarantees to any extent for the large outlay that had been incurred. In the accounts for 1876 there was an item to the credit of revenue account of £1530 water-rent in dispute. Credit was taken for that sum, and had it not been for that £1530 so put in, there would not have been sufficient that year to have paid full interest on all the preference capital. Now, he wished to know whether that £1530 had been paid, or whether it was still owing. If owing, he did not see that it was brought forward in the present accounts. He was very glad to find that, in one respect, the Company had conceded to consumers of water, in some degree, upon the bath question. Some of them had felt very strongly that it was hard that they were paying extra for baths, when they considered it should be included in their water-rental. There was another thing to which he wished to refer. He would not sit in judgment against the Company; but he must say there would be a great outcry in the town if they attempted to charge the water-rate in advance. The Company knew why they were doing it, and, where the rent was doubtful, it was right to get it in advance; but it was not right for regular consumers to have to pay the water-rate in advance, and he felt sure people would kick against it, and that such a course would cause the Company to have many enemies. The only other matter he wished to touch upon was the question of hydraulic power. In Liverpool, the Corporation, or other Authority who had the water supply, obtained £50,000 per year for selling water for hydraulic purposes. It was not likely,

of course, that in Sheffield such a large amount of money could be obtained from the same source, because there was not so much power required; but he did think they might improve the interests of the Water Company materially by selling water for other than ordinary domestic and manufacturing purposes—that, in fact, they might occasionally supply it for hydraulic purposes, and by that means largely increase the income of the Company.

Mr. PERCY SMITH said the Chairman had requested him to reply to Mr. F. E. Smith's questions, and he would do so, except as regarded the question with respect to the land at Crookesmoor, which he would leave Mr. Colley to answer. In the first place, Mr. Smith had remarked that £60,000 had been added to the capital account; and then asked how could £1840 increased revenue pay the interest on that amount. Well, nobody ever said that it could, and it was not intended to do so; in fact, the £1840 which had accrued on the increased revenue, accrued absolutely, or at least a good deal of it, before the £60,000 was laid out. As to the £60,000 increased capital, the Shareholders would see by the report that a large proportion of that amount had been charged against capital, by order of the Court of Chancery, to recoup payments for interest on the non-productive works, which had necessarily, in the first place, been allowed out of revenue. About £38,000 had been spent in that way—£25,000 for the years 1876 and 1877, and about £13,000 for last year's interest on Dam Flask, which was still unutilized. The remaining £22,000 of capital had been expended in land purchases in the Ewden Valley, which the Company were under parliamentary obligation to buy, and in the extension of the Company's pipes. As to the land purchases, the bulk of them were completed, and consequently there would be in future but comparatively little further outlay on that head. As to the extension of pipes, he hoped the outlay under that head would go on as long as the Company lasted, because as soon as ever there was a fresh demand for water there must be new pipes to carry it where the demand arose. Mr. Smith had asked some questions as to the part which the Duke of Devonshire had taken in the supply of water to Dore. Well, the Duke of Devonshire behaved very handsomely to the Company, and the Directors were perfectly well satisfied with the way in which his Grace had treated them. As to the water-rents in dispute in 1876, all he could tell Mr. Smith was that the amount still remained unsettled, and that the question was one which the Directors were dealing with, and which they considered themselves competent to deal with without any assistance from the Shareholders. If any portion of the amount was lost, it would, of course, be debited against the amount when it was lost; but at present they looked upon it as a good asset, and they believed it would be paid in full. As to supplying water for hydraulic purposes, it had often been urged that a large amount of revenue might be made if the Company would only supply water power to small engines; and a good deal of outcry had been made about the matter at times, it being considered a grievance that Sheffield could not be supplied with water for the purposes of power, as was done in other towns. Well, one of the first things which the present Directors did on being elected was to take up that question; and, after consultation with their Engineers, they came to the conclusion that, subject to certain minor stipulations being made, they could supply water for the purposes of power. A resolution was thereupon passed to that effect; and though he believed every effort had been made to bring the decision of the Company under the notice of the public, from that day to this not a single application had been made for water for power. That certainly was not the fault of the Company. Mr. Smith talked of the amount which the Company could make in this way; but, before they could sell, they must have buyers, and as regarded water for power, there had been none. Now as to what was generally called the bath question. That was, until recently, looked upon as an exceedingly trivial affair. Whatever might be the doubt that was thrown by quibblers upon the construction of the Act of Parliament, the charge for baths was looked upon generally as so reasonable and so just, that only two or three people, and those the avowed enemies of the Company in its present form, thought fit to dispute payment. The Directors did not think it worth while to go to law, and squander the money of the Shareholders in an attempt to collect money from a few crotchety people. But at length these people found an ally in an unexpected quarter. One of their own body—a Shareholder—went to the assistance of the objectors, and talked about this bath question, not only at the annual meetings, but on the Stock Exchange and in the streets. What were that gentleman's motives in thus apparently trying to damage his own property he could not define; but whatever they were, he certainly succeeded in attracting considerable attention to the bath question, and the ranks of the dissenters, if he might use the term, had been very much increased by his means. It would now become the duty of the Directors to deal with that question, and they would do so under competent legal advice. They would endeavour to deal with it in a way that would set the matter at rest for ever. The Directors all believed that they would be successful, and that the decision would be in the Company's favour. He might say that the amount involved was considerably less than was supposed; and even if the decision went against them, he did not think it would have any perceptible influence on their future dividend. With respect to the selling of water for hydraulic and other purposes, Mr. Ashton had just told him that since the Directors arrived at the decision he had before mentioned, they had had some nine or ten small applications; but, in point of fact, the terms had not been agreed upon in a single instance.

Mr. F. W. COLLEY, replying to Mr. Smith's question with respect to the Crookesmoor land, said the land which had realized £20,377 was only a very small portion of that which the Company held, and did not represent anything like the whole even of the Crookesmoor lands. They had in that neighbourhood 15 acres of land which they could sell or lease at any moment, and indeed they had now several offers to lease portions of it. There were also other lands in the same district which would ultimately become saleable by the Company, besides the surplus lands at Bradfield, which were as yet quite untouched. At Bradfield they had something like 200 acres all marketable, but it would not answer the purposes of the Company to sell now. They would wait a more convenient opportunity—for better times. It was not right that the Shareholders should go away with the impression that £20,377 represented anything like the value of the Company's lands; a much larger amount would shortly be realized.

Mr. F. E. SMITH said that till last quarter he had paid his water-rate in full, and had never wanted to deduct anything for his bath. He had twice objected to the amount of the rate, and twice it had been reduced, because the charge was wrong. He, however, still went on paying, including the amount of his bath. It was only when the Company said to other parties, "You may pay without prejudice; you may pay your rent, deducting the amount of your bath," that he did the same. He considered the Company ought to get every sixpence of revenue that they could legally, properly, and honourably demand; but what he felt, as one of the Shareholders, was this: Was it a right thing that the Company should be making what he conceived to be an illegal charge—the bath-rent—which was already included in the rental of the property? He, therefore, said to several persons, "Don't pay the bath-rent." If the Company had a right to demand it, they could legally make a person pay.

The motion for the adoption of the report was then put, and unanimously agreed to.

On the motion of the CHAIRMAN, seconded by Mr. HAWKSLEY, a resolution was adopted declaring a dividend at the rate of 2 per cent. per annum, free of income-tax, inclusive of a dividend of 1 per cent. paid on the 1st of November last.

The retiring Directors were then re-elected, Mr. H. Jubb, of Rotherham, being chosen to fill the vacancy at the Board; and a vote of thanks was passed to the Chairman and Directors for their services during the past year.

The proceedings then terminated.

## RIO DE JANEIRO GAS COMPANY, LIMITED.

The Fourteenth Annual General Meeting of this Company was held at the Cannon Street TerminusHotel, London, on Thursday, the 3rd of April—Mr. LEWIS HOWARD, the Managing Director, in the chair.

The SECRETARY (Mr. T. Dawson) having read the notice convening the meeting, the following report was taken as read:—

The Directors, in accordance with the Articles of Association, paid on the 5th of October last an interim dividend of £37,500, free of income-tax, being at the rate of 10 per cent. per annum on the present paid-up capital of the Company; and now have the pleasure of submitting to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1878, and showing a balance at the credit of profit and loss account of £106,297 4s. 1d., reduced by the above-mentioned interim dividend to £68,797 4s. 1d.

Out of this sum of £68,797 4s. 1d. the Directors recommend that a dividend at the rate of 10 per cent. per annum, also free of income-tax, be paid for the half year ending the 31st of December last. This will reduce the available balance to £31,297 4s. 1d., which the Directors have disposed of as follows:—They have placed £28,000 to the insurance and contingency fund, and have carried forward to the next account the remainder, say £3297 4s. 1d., out of which income-tax for the past year has been paid.

The reserve-fund for the equalization of dividends remains at £10,000, and the insurance and contingency fund now stands at £106,006 18s. Of this amount, however, there remained still to expend £8291 10s. 11d., which has been already distributed amongst the Shareholders in the last issues of bonus shares, leaving £97,715 7s. 1d. available for prospective expenditure, and all of which will probably be required for the purposes already indicated, in the event of the Company obtaining a new contract.

Up to the 31st of December last, there had been expended on gasholder No. 3 and new mains £141,708 9s. 1d., as stated in the balance-sheet, and since that date, the greater part of the remaining £8291 10s. 11d., as referred to above, has been expended in goods already, and to be shipped.

Although the result of the Company's operations for the past year, as evidenced by the statements now presented by the Directors, is not so favourable as that of the preceding year, they still think that, on the whole, it is satisfactory, taking into consideration the loss by depreciation of the exchange in Rio de Janeiro, and the decrease in the consumption of gas in consequence of the prevalence of yellow fever there.

Mr. John Henry James is the retiring Director in accordance with the Articles of Association, and, being eligible, offers himself for re-election.

The Board regret to say that one of their number—Mr. M'Gregor—is, for the present, prevented by illness from attending their meetings with his usual regularity. Two other Directors being absent on the Company's business at Rio, there is just now some difficulty in obtaining the attendance of a quorum. The Board, therefore, as a temporary measure, have elected the Solicitor of the Company, Mr. George M. Clements (being duly qualified), to fill the vacancy caused by the retirement of Mr. Hancox.

The Auditor, Mr. Harding (of the firm of Harding, Winney, and Co.), also retires, and offers himself for re-election.

By the special report issued on the 3rd of September last, the Board informed their Shareholders that the Ministry of Public Works had appointed three valuers to value the Company's works and property, and had issued notices inviting tenders from other persons to light the city of Rio de Janeiro with gas after the 25th of the present month. Those officials reported the value of the Company's works and plant to be Rs.5,303,512 104 dols., which, at the gold exchange of 27d. per milreis (the exchange applicable to the valuation), is equal to £596,645 sterling, to which will have to be added the value of coals and other stores. The foregoing figures are the same as those given out at the Brazilian Legation in London, as being the price which would have to be paid for the works and plant by any one obtaining the concession.

In their last annual report of March 20, 1878, the Board mentioned that their colleague, Mr. Bartlett James, who was about proceeding to Rio de Janeiro, would co-operate with the Chairman, His Excellency the Viscount de Mauá, in everything relating to the affairs of the Company. The Ministry of Public Works at first did not seem disposed to negotiate with those gentlemen on satisfactory terms, evidently under the impression that more favourable conditions could be obtained through public competition. The Ministry, however, received no tenders (doubtless owing to the very onerous nature of the conditions required), and, in consequence, negotiations had been resumed between His Excellency the Viscount de Mauá and Mr. Bartlett James, on the one hand, and the Ministry on the other. No progress had, however, been made up to the date of their last communications, the rather unsettled state of political affairs preventing the possibility of the Ministry attending to any business beyond the serious questions of the moment. The Directors are, however, not without hope that, before long, they may receive some satisfactory intelligence, and, if so, will immediately communicate it to the Shareholders, who will easily see that, in these circumstances, it is not in their interest, at the present moment, to enter into further explanation of details.

DR.—*Balance-Sheet, for the Year ending Dec.* 31, 1878.

| | | | |
|---|---|---|---|
| To Capital, 37,500 shares of £20 each, fully paid up | | | £750,000 0 0 |
| Sundry creditors at Rio and London | | | 2,548 5 2 |
| Dividend warrants still unclaimed | | | 475 12 0 |
| Bills payable | | | 2,727 14 6 |
| Reserve-fund | | | 10,000 0 0 |
| Insurance and contingency fund— | | | |
| Balance brought forward from Dec. 31, 1877 | £78,006 18 0 | | |
| Amount carried to this fund this year | 28,000 0 0 | | |
| | £106,006 18 0 | | £106,006 18 0 |
| Less amount already capitalized by decree of Brazilian Government, but not yet expended | 8,291 10 11 | | |
| Amount available for further extensions and expenditure | £97,715 7 1 | | |
| Profit and loss— | | | |
| Balance of profit brought forward from Dec. 31, 1877 | £3,272 0 3 | | |
| Less income-tax for 1877 | 1,181 7 8 | | |
| | £1,090 12 7 | | |
| Net profits for the present year | 105,206 11 6 | | |
| | £106,297 4 1 | | |
| Deduct carried to insurance and contingency fund | 28,000 0 0 | | 78,297 4 1 |
| | | | £950,055 13 9 |

CR.—*Balance-Sheet.*

| | | |
|---|---|---|
| By Sundry assets, viz.— | | |
| Gas-works, houses, land, 128 miles of mains, asphalte works, mules and carts, lighters, &c. | | £582,705 14 8 |
| New gasholder, No. 3, additional mains, &c. | | 141,708 9 1 |
| Coals | | 17,810 0 0 |
| Gas-fittings | | 2,776 17 3 |
| Sundry debtors, being gas consumers at Rio | | 49,336 16 5 |
| Office furniture | | 149 10 6 |
| Investment in public funds | | 38,757 10 0 |
| Cash at Rio | | 102 3 4 |
| Cash in London | | 13,482 18 6 |
| Bills receivable, in hand | | 63,130 15 5 |
| Shipments afloat | | 2,594 18 7 |
| Interim dividend of the 5th of October last, paid to Shareholders at the rate of 10 per cent. per annum on £750,000 | | 37,500 0 0 |
| | | £950,500 13 9 |

The CHAIRMAN: Gentlemen, there is but very little to add to the information contained in the report. We had hoped to be able to tell you that something had been settled about our contract. Our latest letters are up to the 10th of March. Negotiations were then going on, and we have every reason to suppose that the firm but conciliatory policy which the Directors have adopted in carrying on the negotiations, both past and present, will bear good fruit. We have reason to suppose that there is a friendly feeling on the part of the Government officials—or, at all events, the highest—and that the conduct of the Rio Gas Company—the way in which they have conducted their business during the term of the contract—has given satisfaction. I think there is very little more for me to say; but I shall be happy to answer any remarks or inquiries that any Shareholders may wish to make, always remembering that negotiations are going on abroad, and possibly before the meeting closes we may have a telegram giving us some intelligence. Therefore, the Shareholders will kindly limit the discussion as much as possible, avoiding details. I now move—"That the report of the Directors for the year ending the 31st of December, 1878, be received, adopted, and confirmed."

Mr. J. H. JAMES seconded the motion.

Mr. WORDSWORTH said he noticed that the valuation put on the Company's works by the Brazilian Government was £596,645. In the valuation taken by the Company itself, including the new gasholder, the amount was £724,414 8s. 9d. If they added to that nearly £3000 for gas-fittings, there was a good difference between the valuation of the Company and that of the Brazilian Government. He would like to have some explanation as to how the valuation was arrived at, and the great discrepancy between the two. He also saw in the report, that, owing to the absence of two of the Directors in Rio, and the difficulty of getting a quorum, the Solicitor of the Company, Mr. Clements, had been elected to fill the vacancy caused by the retirement of Mr. Hancox. As a considerable Shareholder in the Company, he did not think that the Solicitor should also be a Director of the Company, as it converted the Board into what one might call a very close borough. He thought that on another occasion of this kind it should be remembered that there were other Shareholders who were duly qualified.

Mr. H. D. YOUNG asked whether the contract with the Brazilian Government was concluded or not.

Mr. WEIR asked whether, in future, the register of members would be kept in accordance with the statute. On the 19th of March he went to the offices of the Company, and on inspecting the register he found that the numbers were in pencil. He had asked if he could see a perfect register after the books were opened, but he had received no satisfactory reply. He thought, as a company, they were liable to a penalty for failing to keep the register in accordance with the statute.

Mr. NATHAN said he had noticed that there was an available balance of £97,715 for prospective expenditure. He took it for granted that there had been no expenditure made since the question of the new contract for new plant, and that it was not proposed to lay out the same unless a new contract were obtained.

Mr. JAMES: That is so.

The CHAIRMAN said if no other Shareholder desired to ask any question, he would answer the first—the difference in the valuations. It was quite true that the gas-works, houses, the new gasholder, and everything that they had, stood in the Company's books at £724,000. Their works had always been kept up to a constant state of efficient repair; but that did not make pipes underground new, nor did it make the gasholder, which was erected some years ago, new; and, therefore, the valuers, in taking what they could not but consider a reasonable valuation of the Company's property, had not given its value when it was all bought and laid down as new, but what they considered it worth at the present time. In that, he thought, they had no reason to complain. The valuation was not so bad when they came to take all particulars into consideration. For instance, the 5,300,000 milreis, or £596,000, to which would be added about 700,000 milreis, together 6,000,000 milreis, yielding, at the par of exchange of 27d., £675,000, they would have to receive from the Government. That, he thought, would be about the least; but he could not bind himself to exact figures, because the valuation of part of the property—coals, stores, &c.—would have to be made when the property was valued, if they did not obtain a renewal of the contract. In addition to that £675,000, he begged to call the Shareholders attention to the fact that in the balance-sheet there was £49,000 representing debts in Rio, with very trifling exceptions—perhaps with none at all—all good, as owing by consumers. They also had, according to their balance-sheet, nearly £39,000 invested in public funds—Consols; they had cash in London at that time £13,482, and they had in bills receivable—every one of them as good as Bank notes—£63,000. That made a total of assets of the Company, supposing they were wound up, of £839,000, from which they would deduct the dividend, which no doubt the present meeting would pass; that would leave them, as against £750,000 of capital, £802,000 of assets. That would include everything; they would have £802,000, and that was taking the thing at the worst—assuming that they did not get a contract. With regard to the appointment of Mr. Clements, his colleague and he—but more particularly he—must bear the blame, if the meeting thought they deserved any. They had fully expected to have Mr. M'Gregor, their Vice-President, with them; but he was taken ill, and had thus been prevented from attending to his duties. He (the Chairman) saw that they were thus placed in a very awkward position, because two of the Directors were engaged on the Company's business in Rio, and the necessity then became paramount that they should secure as a Director—only temporarily, he begged them to understand—a gentleman with a thorough knowledge of all the affairs of the Company, and of all the negotiations that were going on in Rio. The only person who fulfilled these requirements was Mr. Clements, their Solicitor, and he at once asked that gentleman to accept the position. He did this in the best interests of the Company, as securing for a time the services of a gentleman who had advised them ever since they had been a Company, whom he had been in the habit of consulting from day to day, according to the negotiations at Rio, and with regard to the business generally. Mr. Clements demurred, but at his (the Chairman's) urgent request, he consented to act for a time, on the understanding that his directorship was not to be considered permanent. He hoped that that explanation was satisfactory.

Mr. JAMES said he must decline to allow Mr. Howard to take the whole responsibility of Mr. Clements's election. He considered that it was the best thing they could do on the spur of the moment. However, they took the extra precaution of telegraphing for the approval of the two Directors in Rio to the appointment of Mr. Clements.

Mr. CLEMENTS said he had no doubt that many of the Shareholders then present were better qualified for the position of Director than he, but he doubted whether any gentleman would like to go on the Board as he had done—as a mere "stop-gap." He should decline peremptorily and positively to accept the office of Director of any company—it was not his business. There were, however, such things on a board as a quorum, and a quorum was wanted in order to make certain acts legal.

Mr. WORDSWORTH said he had looked on the matter as a question of principle, and the explanation given was perfectly satisfactory.

Mr. CLEMENTS observed that the next question that had been asked was purely a legal one—as to the register of members; but he thought when he stated how the case stood, all the Shareholders would be satisfied. He had not seen the register of Shareholders till the previous day, but he found that it was kept in such a way as to give all the information the statute prescribed should be given to the Shareholders. He himself did not think that pencil was a convenient medium of writing, and he therefore recommended the Secretary to use ink in future. However, all the information was given.

Mr. GORDON remarked that he had no doubt that the Company was conducted in every way in accordance with the statute. He regarded their present position as one of difficulty, and thought the Directors required all the support they could obtain. He considered that the more firm but conciliatory course they pursued in the negotiations, the better. No doubt it was a disappointment to many of the Shareholders that they could not obtain all the information they desired to have at that meeting. However, if they did wind up, they knew they would receive 20s. in the pound; but he rather believed they would obtain another contract.

A SHAREHOLDER suggested that the Shareholders should have a profit and loss account furnished to them, showing the expenses of management in London and in Rio. They could not tell what these expenses were in their present balance-sheet.

Mr. H. D. YOUNG asked whether it were true or not that the contract with the Brazilian Government was concluded. He should like to have an answer to that question.

The CHAIRMAN, in reply, said as he had intimated, in his opening remarks, that they had not, up to the present, received any decisive answer.

The resolution for the adoption of the report was then agreed to.

The CHAIRMAN said the next resolution was—"That a dividend at the rate of 10 per cent. per annum, free of income-tax, be declared for the year ending the 31st of December last."

The motion was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. WORDSWORTH, Mr. John Henry James was re-elected a Director of the Company. Mr. Harding was also re-appointed Auditor.

Mr. BUCKINGHAM proposed a vote of thanks to the Directors for the manner in which they had conducted the Company's business since the last meeting. Considering the difficulties against which they had had to contend, he thought they had managed the Company's affairs with great care and caution.

Mr. GORDON seconded the motion, and it was carried unanimously.

The CHAIRMAN, in reply, thanked them most sincerely for their vote of confidence in the Board, and of their appreciation of the Directors services. All he could say was that, placed as they were in somewhat trying circumstances, they would continue to do their best for the interests of the Company; and they hoped that, by a continuation of the firm but conciliatory policy they had hitherto pursued, they would attain their end before very long.

The proceedings then terminated.

## BRISTOL WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held on Saturday, the 29th ult.—Mr. C. J. THOMAS in the chair.

The SECRETARY (Mr. A. J. Alexander) read the Directors report as follows:—

The revenue from water-rates for the year 1878 was £60,850 5s. 10d., being an increase of £3035 3s. 6d. over that of the previous year.

The sum shown by the revenue account annexed to be applicable for dividend, is £17,088 16s. 4d., and the Directors recommend that a dividend of 5 per cent. on the ordinary £25 and £20 shares be now declared. This, with the intermediate dividend of 5 per cent., will make the dividend for the year 10 per cent., and leave a balance of £1609 0s. 1d., out of which the Directors recommend payment of 2s. 6d. per share to the Proprietors of the ordinary £25 shares, which, with 5s. 6d. per share paid on the 15th of October, will make 5s. per share paid for 1878, on account of arrears of dividend, and leave £609 0s. 1d. to be carried forward.

The 8000 £6 and 8000 £4 10s. shares, created by resolution of the extraordinary general meeting, held on March 30, 1878, were offered, in accordance with the terms of the resolution, to the Proprietors of the £25 and £20 ordinary shares. There remain on hand 322 £6 and 109 £4 10s. shares, and the Board, being of opinion that as the date approaches when these shares will be entitled to 10 per cent. dividend, their value will increase, believe that it is in the interest of the Proprietors not to dispose of them for the present; but, with a view to determine the appropriation of the premiums when realized, a sum has been carried to the reserve-fund equal to the value of the premiums on the shares not issued, calculated at the medium market value on the 31st of December last.

The number of premises to which the water has been laid on during the year, largely exceeds that reached in recent years, and this fact, taken in conjunction with the increase of the revenue, is satisfactory.

The extension works at the Victoria pumping-station are approaching completion, and the stand-pipe to be erected on Durdham Down, in order to increase the pressure at the highest points of your district, will now be proceeded with.

At the Chelvey pumping-station, the progress of the new works has, until recently, been retarded by the severe weather.

The Directors report with deep regret the death of their late valued colleague, Mr. Richard Fuidge, who, during 23 years, took an earnest interest in the affairs of the Company.

The vacancy at the Board has been filled by the election of his brother, Mr. William Fuidge.

The Company's water was laid on to the Avonmouth Dock in August last, and a considerable increase in the demand for the water in that neighbourhood may reasonably be expected.

The Counterslip Sugar Refinery, formerly a large consumer, was closed during the whole of 1878, but has this year recommenced working, and is again supplied by the Company.

The capital expended during the year was £38,343 3s. 7d., and the length of main laid about 15 miles.

The Engineer reports that the works are in good condition.

The retiring Directors are Mr. Thomas, Mr. Wills, and Mr. Bush, who are eligible, and offer themselves for re-election.

The retiring Auditor is Mr. Curtis, who offers himself for re-election.

Dr.—*Capital Account to Dec.* 31, 1878.

| | | |
|---|---|---|
| To Debenture stock | | £59,495 0 0 |
| Mortgages and bonds under original Act | | 2,500 0 0 |
| Preference stock | | 100,000 0 0 |
| Debenture stock, 1874 | | 36,505 0 0 |
| Mortgages and bonds under Act of 1853 | | 20,400 0 0 |
| Mortgages under Act of 1862 | | 1,100 0 0 |
| Preference shares, Act of 1862 | | 80,000 0 0 |
| Mortgages under Act of 1865 | | 5,600 0 0 |
| Preference shares, Act of 1865 | | 80,000 0 0 |
| Original shares | | 200,000 0 0 |
| £20 ordinary (1872) shares | | 99,262 0 0 |
| £6 ordinary (1878) shares | | 15,356 0 0 |
| £4 10s. ordinary (1878) shares | | 11,836 10 0 |
| Balance | | 41,474 6 11 |
| | | £752,928 16 11 |

Cr.—*Capital Account.*

| | | | |
|---|---|---|---|
| By Expended, as per last account | | | £714,585 13 4 |
| In the year ending Dec. 31, 1878— | | | |
| Parliamentary and professional charges | £98 14 10 | | |
| Construction of works | 32,664 7 6 | | |
| Mains and service-pipes | 5,580 1 3 | | |
| | | 38,343 3 7 | |
| | | £752,928 16 11 | |
| Balance brought down | | | £41,474 6 11 |

Dr.—*Revenue Account.*

| | | | |
|---|---|---|---|
| Dec. 31, 1877— | | | |
| To Balance of revenue account to this date | | £16,627 19 7 | |
| Less dividend of 5 per cent. paid April 16, 1878 | £14,396 6 0 | | |
| Less paid April 16, 1878, on account of arrears of dividend on original shares | 2,000 0 0 | | |
| | | 16,396 6 0 | |
| | | | £231 13 7 |
| Dec. 31, 1878— | | | |
| Water-rates | | | 60,850 5 10 |
| Rents | | | 335 5 5 |
| Transfer fees | | | 28 10 6 |
| Interest balance | | | 496 4 8 |
| | | | £61,942 0 0 |
| Balance brought down | | | £33,115 8 5 |
| | | | £33,115 8 5 |
| Balance | | | £17,088 16 4 |

Cr.—*Revenue Account.*

| | | | |
|---|---|---|---|
| Dec. 31, 1878— | | | |
| By Office and engineering expenses— | | | |
| Salaries | | £1,874 19 8 | |
| Printing and advertising | | 156 7 9 | |
| Incidentals and sundries | | 462 16 6 | |
| | | | £2,494 3 11 |
| Collectors commission | | | 1,489 3 9 |
| Pumping at Chelvey | | | 550 6 3 |
| Expenses of working Victoria engine and maintaining Victoria, Durdham Down, Bedminster Down, Leigh and Knowle reservoirs | | | 1,135 12 5 |
| Wages to men in charge of reservoirs and works in the country, repairs and maintenance | | | 466 16 11 |
| Wages to turncocks | | | 918 5 8 |
| Rates and taxes | | | 4,328 17 11 |
| Repairs | | | 561 4 9 |
| Directors remuneration | | | 800 0 0 |
| Auditors fees | | | 42 0 0 |
| Interest on debenture stock | | | 3,840 0 0 |
| Interest on preference stock to June | | | 2,500 0 0 |
| Interest on preference shares, 1862 | | | 3,600 0 0 |
| Interest on preference shares, 1865 | | | 3,600 0 0 |
| Retained to pay half year's interest on preference stock to December | | | 2,500 0 0 |
| Balance | | | 33,115 8 5 |
| | | | £61,942 0 0 |
| Intermediate dividend paid Oct. 15, 1878 | | | £15,026 12 1 |
| Paid Oct. 15, 1878, on account of arrears of dividend on original shares | | | 1,000 0 0 |
| Balance carried down | | | 17,088 16 4 |
| | | | £33,115 8 5 |

Dr.—*General Balance-Sheet.*

| | | | |
|---|---|---|---|
| To Balance of revenue account | | | £17,088 16 4 |
| Balance of reserve-fund | £2,708 17 6 | | |
| Estimated premium on £6 and £4 10s. shares unsold | 1,776 12 6 | | |
| | | 4,485 10 0 | |
| Sundry accounts due from the Company | | | 34,937 8 5 |
| | | | £56,511 14 9 |

Cr.—*General Balance-Sheet.*

| | | | |
|---|---|---|---|
| By Balance of capital account | | | £41,474 6 11 |
| Arrears of water-rates | | | 6,880 14 5 |
| Sundry accounts due to the Company | £1,639 11 8 | | |
| Estimated premiums on £6 and £4 10s. shares unsold, carried to the credit of reserve-fund | 1,776 12 6 | | |
| | | 3,416 4 2 | |
| Stock in hand | | 4,720 15 1 | |
| Cash in Secretary's hands | | 19 14 2 | |
| | | | £56,511 14 9 |

The Chairman, in moving the adoption of the report, said he had to express great sorrow that the health of Mr. Fry, their Chairman, did not allow of his being present that day. They had also to regret the loss of Mr. Richard Fuidge, who had for some 22 years been a Director of the Company, and of their Solicitor, Mr. Fussell. Referring to the business of the meeting, he said he thought they would all agree with him that the report which had been just read was a very satisfactory one. Notwithstanding the long-continued and extreme commercial depression, both in Bristol and all over the country, it showed an increase in their revenue of over £3000—several hundred pounds more than the estimate made a few years ago. Last year they laid on water to 1756 additional premises—rather more than double the number that they laid even during the best period, six years ago. The building trade continued very good, and therefore everything pointed to a continuation of the increase that had gone on for so many years. To meet this increasing demand for water, they were erecting at Chelvey a very powerful engine to give an additional supply, and they had nearly completed the erection of the engine at the Victoria reservoir, which would enable them to send the water on to the reservoir on the downs, in order to supply the higher levels. He might say that their concern had helped the prosperity of Bristol, and that it had increased with the growth of Bristol. They were now going north and south, and east and west, a distance either way of ten miles, and, consequently, covered a large area of ground. In looking over the reports for preceding years, he observed in the report of 1849 that Mr. G. S. Clarke, then an inspector under the Public Health Act, which at that time had just been put in force in Bristol, was quoted as to the value of these works. Mr. Clarke said that their works were the most magnificent of the kind in England, and that their Engineer, Mr. Simpson, had great reason to be proud of them. The amount of money they had then spent on them was barely £200,000. The gravitation scheme for bringing in the water from the Mendips to the Barrow reservoir was then of not half the extent it was now, and when the new pumping-engine at Chelvey was completed, they would be able to supply from that place alone a larger quantity of water than they supplied altogether in 1849.

Mr. Bush seconded the motion, and it was carried unanimously.

Dividends at the rate of 5 per cent. on the £25 and £20 (£12 paid) ordinary shares, and on the £6 (£2 paid) and £4 10s. (30s. paid) ordinary shares, were declared for the half year ending Dec. 31 last; also a dividend of 2s. 6d. per share on the £25 ordinary shares, towards making up the deficiency of previous dividends; the whole to be paid on the 15th of April.

The retiring Directors and Auditor were then re-elected, and the usual vote of thanks to the Chairman and Directors terminated the proceedings.

Proposed Water Supply and Drainage Works for Axminster.—At a recent meeting of the Axminster Board of Guardians, it was decided, on the recommendation of Colonel Ponsonby Cox, to apply to the Local Government Board for a loan of £2500 for carrying out water supply works, and £3000 for sewerage purposes, the works to be undertaken as soon as possible.

## THE ELECTRIC LIGHT APPLIED TO LIGHTHOUSE ILLUMINATION.

At the Meeting of the Institution of Civil Engineers, on the 25th of March—Mr. J. F. Bateman, President, in the chair—a Paper on the above subject was read by Mr. J. N. Douglass, M. Inst. C.E.

The author showed the progress of lighthouse luminaries from wood and coal fires to the introduction of tallow candles, fatty oils, mineral oils, coal gas, and electricity. In 1839 experiments were made by Faraday, for the Trinity House, at the Orford Low Lighthouse, with the Bude light, and, in 1862, at the South Foreland with the Drummond or lime light, but the results were not so satisfactory as to lead to their adoption. In 1857 experiments were tried at Blackwall with the electric light, produced by the first magneto-electric machine of Holmes; and on the 8th of December, 1858, the electric light, obtained by Holmes's second machine and a "Duboscq" lamp, was shown on the sea for the first time from the South Foreland High Lighthouse.

On the 1st of February, 1862, the Trinity House exhibited the electric light permanently at Dungeness Lighthouse, by Holmes's magneto-electric machines and lamps. The works for the production of the light were described, and the first cost and maintenance given. The intensity of the electric luminary was about 12½ times that of the oil luminary. The cost per unit of light per hour was 0·1165d. for the oil, and 0·1294d. for the electric light. Frequent falling off of the latter light occurred, and the oil light had occasionally to be substituted. Shortly afterwards, the French lighthouse authorities established the electric light at Cape La Hêve, with the magneto-electric machines of the Alliance Company of Paris. In 1867, Holmes further improved his machine and lamp. Two of these machines and lamps were exhibited by the Trinity House at the Paris Exhibition of 1867, with a dioptric apparatus of the third order. The Souter Point Lighthouse was lighted by electricity in January, 1871. The light was adapted to a dioptric apparatus of the third order. A lower light from the same luminary as the upper one was adopted here for the first time. The optical apparatus for both lights was designed by Mr. James T. Chance, M.A., Assoc. Inst. C.E. A "Holmes" fog trumpet apparatus was also worked from the same engines as the electric light apparatus. The total cost of the works was £18,000. The cost of the electric luminary per candle per hour was 0·056d., being rather less than half of the cost per unit at Dungeness. The maximum intensity of the beam from this apparatus was about 700,000 candles. The Trinity House next established the electric light at the South Foreland High and Low Lighthouses, in January, 1872. The apparatus for the production of the light consisted of two steam-engines of 20 effective horse power, four Holmes improved magneto-electric machines and lamps, and two dioptric apparatuses of the third order for fixed white light. The cost of the additional works for these lights was £14,800. The intensity of the full-power beam from the High Lighthouse was about 20 times that of the old first order dioptric oil light. The relative cost per unit of light was as 100 oil to 30·6 electric. In 1873, the Trinity House adopted, for the Lizard Lighthouses, Siemens's dynamo-electric machine and lamp, and a siren fog signal. These were driven by three of Brown's caloric engines, each of 10 effective horse power. The cost of the additional works for these lights was £14,936, and the annual maintenance, including interest on first cost, amounted to £2365 6s. 4d. against £1016 7s. 11d. for the oil lights. The intensity of the full-power beam of each light was about 330,000 candles, being about 211½ times the intensity of the oil light. The relative cost per unit of light was 100 oil to 14·04 electric. The successive improvements in the electric machines, and in the means of driving them, had reduced the cost of the electric light at the Lizard to one-ninth of that at Dungeness, and the quantity of light produced at the Lizard per pound of coke consumed was increased 20 times.

The continued growth seaward of the shingle point at Dungeness led to the removal, in 1876, of the original electric light apparatus, and the substitution of a low flashing oil light and siren fog signal for both lighthouses.

The author furnished information received from M. Allard, Director-General of the French Lighthouses, relative to the electric lighthouses at Cape La Hêve and Cape Grisnez, where Alliance magneto-electric machines and Serrin lamps had been adopted. It was intended to exhibit the electric light in the present year in a new lighthouse on the Isle of Planier, opposite Marseilles, and it had been decided to substitute the electric light for the oil light in the Palmyre Lighthouse at the mouth of the Gironde. Some information was also given relative to the electric lighthouses at Odessa and at Port Saïd, these making ten in which the electric light had already been established.

The comparative cost and efficiency were shown of lighthouse luminaries produced by all the agents at present employed—viz., oil, coal gas, and electricity. Coal gas, on Wigham's system, was applied to the Howth Bailey Lighthouse, Dublin Bay, by the Commissioners of Irish Lights, in June, 1865, and it had since been extended to seven lighthouses on the coast of Ireland. In 1872, the Trinity House adopted it at the Haisborough High Lighthouse. The additional cost of the works necessary for the introduction of gas at this station was £1996, and the annual maintenance of the gas establishment, including interest on first cost, &c., amounted to £832 4s. 3d. This light had a mean intensity of 1173 candles, and a maximum intensity for thick weather of about 2923 candles. In 1877 the necessary additions were made for the lighting of the Low Lighthouse (distant 766 yards) by gas from the same works, at a cost of £1296. The system of Mr. Wigham had been further developed by introducing the flames of two, three, and four large burners over each other in the axis of the dioptric apparatus. In January of last year the Commissioners of Irish Lights adopted one of the latter lights in a new lighthouse at Galley Head, near Kinsale. The maximum intensity of the four burners combined for thick weather was about 5012 candles. The author next gave statements, showing the comparative focussing compactness of the lighthouse luminaries which had been referred to, for utilizing in optical apparatus—viz., the lights produced by oil, coal gas, and electricity. The focussing superiority of the electric luminary, compared with the best of these, was as 616 to 1. Statements were given of the comparative average cost and annual maintenance of a single lighthouse (shore station) in this country, with colza oil, mineral oil, coal gas, and electricity, as the illuminating agents, both with and without a first-class 20-horse power siren fog signal. For a maximum degree of light equal to the single or combined intensity of the luminaries of the Lizard, the cost of the more perfect electric luminary per unit of light provided was about $\frac{13}{24}$ and $\frac{5}{12}$ respectively of that of coal gas, and about $\frac{13}{63}$ and $\frac{5}{28}$ respectively of that of mineral oil, at their maximum intensities. With higher intensities of the electric luminary the cost per unit would be more in its favour, no further addition to the working staff being necessary.

From experiments by Faraday for the Trinity House, in 1836, relative to the penetrative power of lights, through such obstructions as fog, mist, &c., and the more recent experiments by the French Lighthouse Authorities and by the Trinity House, with oil and electric lights, it might be assumed that, with the atmosphere so impaired for the transmission of light that the oil luminary at its maximum intensity would be fairly visible at the fog signal range of two miles, the electric luminary at its double Lizard

intensity of 16,500 candles would be visible at about four miles. Further, that on more frequent occasions, when the oil luminary would be visible at about 8½ miles, the electric light would be visible at the full range of 17 miles.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The recent experiments made with the electric light on behalf of the Dundee Gas Commissioners have apparently failed to give satisfaction to a large number of the Police Commissioners of that town. At an ordinary meeting of the last-named body, held on Thursday, Mr. Frank Henderson, an influential member, submitted the following motion:—"That the whole subject of street-lighting be remitted to the Lighting Committee for careful consideration and report, more particularly as to the construction of the street-lamps, the increase of illuminating power in the lamps, and the practicability of reducing their number thereby or by redistribution, and also as to the partial adoption of the electric light, with powers to make all necessary inquiries." He made a long and interesting speech in support of his motion, which was passed.

A very successful experiment in public lighting was made in Castle Street, Aberdeen, on the evening of Monday, the 7th inst., with one of Mr. Sugg's patent Argand burners and lanterns, at the instigation of the Town Council as Gas Commissioners.

The question of Sunday labour at the Arbroath Corporation Gas-Works was under consideration at a meeting of the Committee of Management held on Monday week. It was resolved to continue the present mode of working, but with instructions to the Manager to give facilities to the men usually engaged on Sundays to get relief as often as desired. At the same meeting it was also resolved to defer purchasing coals till July or August, the present stock being considered sufficient to last till that time. The plan of an additional scrubber to free the gas from ammonia was examined and approved of.

On Tuesday of last week the new works of the Coatbridge Gas Company were formally opened by the Chairman of the Company (Mr. John Alexander, of Messrs. William Baird and Co.'s, Gartsherrie Iron-Works), in presence of the Directors and a number of the Shareholders, and a large gathering of the consumers. After turning on the gas in the centre of the town, which is nearly a mile from the works, Mr. Alexander delivered a short address, in which he congratulated all concerned on the completion of the works. The Directors and a number of their friends subsequently adjourned to the Coatbridge Inn, where several toasts suitable to the occasion were proposed and responded to. Mr. Mitchell, the Manager, from whose designs the works had been erected, was highly complimented upon the successful manner in which he had carried out his share of the undertaking.

At a meeting of the Glasgow Corporation Water Commissioners, held last Thursday, the Engineer, Mr. J. M. Gale, submitted his quarterly report, which stated that the average daily consumption of water had been 38,450,000 gallons, or an increase of 4,950,000 gallons over the quantity consumed in the corresponding quarter of last year.

The Edinburgh and District Water Trust have agreed to give a supply of water to Musselburgh, at the rate of 3d. per 1000 gallons.

In reply to a number of owners of property in the town of Annan, who desired a further inspection of the burgh before a new supply of water was declared to be necessary, the Board of Supervision state that they do not need further information, being convinced that a supply of pure water is a necessity for Annan.

On Saturday, the 5th inst., Edinburgh Gas Company's stock was disposed of at £45 per share; and on the same day the Glasgow 9 per cent. gas annuities were sold at £208, being a decline of £1; the £4 Corporation water annuities changed hands at £104—the former quotation; and the Aberdeen gas annuities were sold at £5 18s. 9d. cash. There were further transactions in Edinburgh gas stock, and in Glasgow gas and water annuities, on Wednesday and Thursday, but Tuesday's prices were maintained.

The Glasgow pig iron warrant market was strong during the past week, and an extensive business was done at advancing prices; the highest quotations, however, were not maintained. At the close of Thursday the price receded to 43s. 1½d. cash. Some special brands are firmer.

There is no change to report in the prices of coals in the Glasgow market, and the demand continues to be quiet for all descriptions.

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AYLSHAM GAS COMPANY.—At a meeting of Shareholders on Thursday, the 27th ult., a dividend was declared of 5 per cent. and 5s. per share, being equal to 7½ per cent.

SALE OF GAS SHARES AT LONG EATON.—On Thursday last, 440 shares in the Long Eaton Gas Company were sold by auction, 220 new shares (£2 paid) realizing £4 5s. to £4 10s. each, while a similar number of original £5 shares sold for £8 17s. 6d. a piece.

REDUCTION IN THE PRICE OF GAS AT LINCOLN.—At the half-yearly meeting of the Lincoln Gas Company, held last Wednesday, it was announced that from Lady-day last the price of gas was reduced from 3s. 4d. to 2s. 11d. per 1000 feet.

THE PROPOSED PURCHASE OF THE STROOD WATER-WORKS BY THE ROCHESTER CORPORATION.—We learn that the Directors of the Strood Water-Works Company have decided on offering the entire concern to the Corporation of Rochester, who are, by their Bill now before Parliament, applying power to acquire the same for the sum of £6700, which is the amount fixed by Mr. Bramwell, the Engineer appointed to settle the value.

STEYNING GAS COMPANY.—At the nineteenth annual meeting of this Company, held on the 1st inst., the report presented stated that the amount of business done had exceeded that of the past year, and recommended a dividend of 6 per cent., free of income-tax. Mr. E. Cripps was appointed Chairman in the place of Mr. G. Michell, who had resigned, and the retiring Directors and Auditors were re-elected.

TAPPING AN ARTESIAN SPRING AT NELSON.—We are informed that at a bored tube-well Messrs. Le Grand and Sutcliff are just completing at Brown and Astley's Brewery, Nelson, near Burnley, they have tapped an artesian spring at 155 feet deep. This spring rises to the extraordinary height of 37 feet above the surface, and as it is increasing in strength daily, it is expected it will shortly flow over into the tank of the brewery, which is 41 feet above the surface.

CHEADLE WATER-WORKS COMPANY.—On Monday, the 7th inst., the annual meeting of this Company was held—Mr. R. J. Smith in the chair. The reports of the Directors and Auditors were submitted and approved, and a dividend of 4 per cent. was declared. The retiring Directors, Messrs. R. J. Smith and Rupert Bowers, were re-elected; and Messrs. Edwin Dean and William Salt were elected Auditors for the ensuing year. A vote of thanks to the Chairman terminated the proceedings.

DONCASTER CORPORATION WATER UNDERTAKING.—The Local Government Board have just intimated to the Town Clerk of Doncaster (Mr. W. E. Shirley), with reference to the application of the Town Council for a Provisional Order to alter the Doncaster Corporation Water-Works Act, 1873, that the Board are prepared to issue a Provisional Order to extend the limits within which the Council can supply water under the Act, so as to include Denaby, Bentley-with-Arksey, and Long Sandall-with Wheatley, and to empower them to borrow a further sum of £35,000, to be repaid within 60 years from 1880.

CONTEMPLATED PURCHASE OF THE BISHOP AUCKLAND GAS COMPANY BY THE LOCAL BOARD.—We understand that some informal negotiations are at present on foot with a view of the sale of the existing gas-works to the town. We have heard of a resolution being in course of signature by some of the principal consumers, urging the Local Board to purchase, if they could do so "on fair terms," but the precise arguments on which the recommendation proceeded have not transpired. As far as we have been able to ascertain, some of the Directors of the Gas Company have suggested a price somewhere between £25,000 and £26,000, whilst some members of the Local Board have recommended offering a price of from £15,000 to £17,000.—*Northern Echo.*

THE DRAINAGE OF BOGNOR.—The Bognor main drainage works were commenced in the London Road, on the 24th ult., in the presence of the Rev. G. W. Fishbourne (Chairman of the Local Board), Mr. F. Yarnell and Mr. A. T. Long (members of the Board), Mr. T. Janman (Clerk to the Board), Mr. Hayward (the Contractor), Mr. Arthur Smith (Engineer), Mr. Wood (Clerk of the Works), Mr. Stringfellow (Surveyor to the Board), and a large concourse of spectators. The Rev. G. W. Fishbourne said Mr. Hayward, the Contractor for the works, had expressed a wish that the members of the Local Board should be present at the starting of them, and that he, as Chairman of the Board, should break the surface of the road as a public commencement. The first scheme was laid before the Local Government Board in 1874, but was refused by Mr. Harrison, the Inspector. New schemes, however, were invited in 1878, and Mr. Smith's (of Bognor) selected. Directly a scheme had been approved of, the Board issued advertisements for tenders for the works, and from several tenders, Mr. Hayward's, for £6000, was accepted, and would cover everything. The town had long felt the want of a proper drainage system, as the cesspools had contaminated the water. He hoped the Engineer's reputation would take another step up the ladder, and that the Contractor would derive good profit from the undertaking. The reverend gentleman then proceeded to break the surface of the road, which had been previously loosened by one of the workmen, and having made a hole about a foot long, and wheeled the dirt away, he wished all those connected with the undertaking "God's speed," and the ceremony ended.

BUENOS AYRES GAS SUPPLY.—Mr. W. Woodgate, the Manager of the Compania del Gas Argentino, in his report to the Directors for the year 1878, states that the net earnings of the Company, after making allowance for bad debts and probable losses, amounted to 937,176 dols. m/c. The comparative tables which accompany the report, and which embrace a period of three years, show a very satisfactory increase in the Company's business. In reference to this concern, the *Buenos Ayres Standard* of Feb. 7 says: "The Company was originally formed by a French gentleman, M. Bernardo Larroude, aided by eleven native capitalists, to manufacture gas from tallow and other '*sustancias oleosas.*' In 1871, Mr. Woodgate was appointed Manager, when he soon discovered that the manufacture of gas from these materials could only result in one way—viz., in the gradual loss of the capital of the Company. He therefore recommended a radical change in the works, so as to enable the Company to make gas from coal instead of grease. This recommendation was only partially adopted at first, and so valuable time was lost, and it was not until July, 1872, that the Company began to supply coal gas. The result proving satisfactory, the Directors resolved to enlarge their plant, which was effected in 1873-74. The borrowed capital, which amounted to over 8 millions of the 10 millions of capital, has now been paid off out of profits, and at the last general meeting a distribution of the unissued shares was voted, amounting to about 32 per cent. of the capital subscribed."

NEW RESERVOIR FOR THE KEIGHLEY WATER-WORKS.—As the Black Hill reservoir for the Keighley Water-Works is now complete, a few particulars respecting it may not be without interest. It was commenced in the summer of 1875. Though originally intended to be simply a high-service reservoir, it was subsequently determined to utilize it also for the purpose of filtration. The supply of water to it, derived from the watershed of the River Worth, is brought by cast-iron pipes from the recently-constructed Water Sheddles reservoir, distant seven miles, and situated at an elevation of 1100 feet above the sea level. The Black Hill reservoir, though 300 feet lower than the Water Sheddles reservoir, is still from 400 to 500 feet above the general level of the town, thus providing a pressure amply sufficient for all purposes. The length of the reservoir at the surface of the top water is 250 feet, the breadth is 140 feet, and the depth of the water is 18 feet, or 13 feet to the top of the filter-bed. The bottom and sides of the reservoir for a height of 5 feet are formed of 6 inches of concrete, laid upon puddle, and the remaining portion of the interior of the reservoir is pitched. The filtering material is composed of several layers of clean sandstone, broken to various sizes, and 2 feet of sand. The reservoir was partially filled in December, 1876; but a settlement having taken place in the embankment, the water-tightness was disturbed, and further expenditure necessitated. It has now been completed, and proved to be perfectly sound. The cost, including the filter-bed and pipes, has been about £5000. The work has been carried out by Mr. John Lee, contractor, of Bingley, under the superintendence of Mr. T. C. Ellis, who represents Mr. F. C. Stileman, the Engineer to the Local Board.

THE SEWERAGE QUESTION AT STOKE.—At the monthly meeting of the Stoke Town Council on the 20th ult.—the Mayor (Alderman Sweeting) presiding—the question of adopting a system of sewerage came up for consideration. Twenty competitive schemes had been proposed for dealing with the sewage. The lowest estimate was £4311, the highest £20,710. Five of the estimates were under £10,000, twelve ranged from £10,000 to £15,000, two being under £20,000, and one above £20,000. Eighteen out of the twenty advocated irrigation; two recommended precipitation by lime or chemicals and downward filtration. Of the eighteen which recommended irrigation, twelve advocated subsidence in tanks without chemicals and downward filtration, and six recommended lime or chemicals as a precipitant. Six of the schemes recommend, along with irrigation, subsidence in tanks and downward filtration. Mr. Lynam read a long report of the Special Sewerage Committee relative to their consideration of this subject, in which, after furnishing comparative statements as to the systems, they recommended the adoption of Scott and Redgrave's system, as applied at Ealing. The various sewerage plans, it was explained, had been submitted to an eminent Engineer of great experience; and the Committee recommended that the first premium of £150 be awarded to Messrs. Scott and Redgrave, and the second (£100) to Messrs. Bailey Denton, Son, and North, London. The recommendation of the Committee as to making terms with Messrs. Scott and Redgrave for the application of their system at Stoke was to be conditional upon the premium being merged in the charge for carrying out the works. This is a system of subsidence in tanks, precipitation by lime, downward filtration, and irrigation. The total cost was set down at £10,890. The recommendation was carried unanimously.

Exhibition of Gas Appliances at Halifax.—Under the auspices of the Gas Committee of the Corporation, an exhibition of gas appliances was opened on Monday, the 31st ult., by the Mayor of Halifax, in the Drill Hall. There was a large gathering at the opening ceremony, including most of the members of the Town Council. The Mayor stated, in his inaugural address, that the object of the exhibition was twofold—first, to show the quality of the gas made by the Corporation; and, secondly, to increase the consumption by drawing attention to the various uses to which it could be put economically. There were some five hundred objects on view, all in some way connected with the production and use of gas—including heating-stoves, cooking-stoves, gas-burners, lamps, engines, sunlights, gas-pressure governors, &c.—and at least thirty exhibitors. Among them were Messrs. Beverley and Wylde, of Leeds, who showed for the first time their new gas-cooking stove—the "Leeds Gas Cooker"—which is so constructed as to retain all the heat produced by the gas, having a lining of Minton's glazed tiles, backed by a patent non-conductor. The burners have Bray's patent enamel tips to prevent corrosion. Messrs. Taylor and Parsons, of Bradford, were large exhibitors, and one of their most ingenious novelties was the "Geyser," which would heat water to 140° at the rate of two gallons per minute, with a consumption of 90 feet of gas per hour. The Halifax exhibitors included Messrs. Watson and Nicholson, Northgate; Mr. R. P. Stafford, King Cross Street; Mr. Henry Edmunds, Silver Street; the Gas Department of the Corporation, Messrs. Holroyd, Smith and Co., the Ellenroyd Brick and Tile Company, and Mr. Joseph Morton. Several of the large houses were well represented, as, for example, Messrs. S. Leoni and Co., London, and Messrs. John Wright and Co., Birmingham. Messrs. George Bray and Co., of Leeds, had a stand of burners and meters. The exhibition continued open during the week.

Testing of Gas Liquor.—Mr. A. M'Donald Graham, of Plymouth, writes to the *Chemical News* in reference to an article, by Mr. T. H. Davis, "On the Testing and Valuation of Gas Liquor," which we reproduced from that paper in the Journal for Oct. 22 last year, Vol. xxxii., p. 603:—To those who have many of these liquors to test, any contrivance that would tend to abridge the labour, and at the same time afford reliable results, would be hailed as a boon, and Mr. Davis is much to be commended for his efforts in that direction. The usual commercial valuation of gas liquors by degrees in Twaddel's hydrometer is so unsatisfactory that it is quite time it was superseded by some better method, and I think the test proposed by Mr. Davis gives at any rate a more reliable indication of the real strength of gas liquor than the method usually employed. I have not, however, found that this test is sufficiently accurate to supersede the usual distillation process, and I am not sure that Mr. Davis intends it should do so. I have recently had five gas liquors placed in my hands for examination, and below I give the results of analysis by the method proposed by Mr. Davis (A), and also by the process of distillation (B)—

$NH_3$ *per* 100 *Parts of the Liquor.*

| | A. | B. |
|---|---|---|
| No. 1 | 2·55 | 2·93 |
| „ 2 | 2·24 | 2·66 |
| „ 3 | 1·59 | 1·86 |
| „ 4 | 2·12 | 2·72 |
| „ 5 | 2·38 | 2·84 |

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

1232.—Farmer, J., Cannock, Stafford, "Improvements in attaching taps or stopcocks to water, gas, and steam pipes for making service or other connections with the said pipes." March 28, 1879.

1234.—Spencer, S., Southwark, London, "Improvements in coronets, domes, and covers for globes, and other forms of glasses for gaslights." March 28, 1879.

1270.—Turner, F. W., St. Albans, Hertford, "Improvements in and relating to gas motor engines." March 29, 1879.

1285.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in gas-regulators." A communication. March 31, 1879.

1309.—Lake, H. H., Southampton Buildings, London, "An improved gaseous compound or mixture designed to be used as a motive-power, which invention also comprises processes or methods for producing and utilizing the said compound." A communication. April 2, 1879.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3915.—Cutler, S., Millwall, London, "Improvements in apparatus used in the manufacture of gas." Oct. 4, 1878.

3925.—Carson, W., Egremont, Chester, "Improvements in and relating to the generation and application of illuminating hydrocarbon gases, and in apparatus connected therewith." Oct. 5, 1878.

5197.—Wilde, H., Manchester, "Improvements in apparatus for producing and regulating electric light." Dec. 18, 1878.

81.—Hedges, K. W., Westminster, "Improvements in electric lamps." Jan. 8, 1879.

166.—Lake, W. R., Southampton Buildings, London, "Improvements in water-meters, which improvements are also partly applicable to pumps and motor engines." A communication. Jan. 15, 1879.

376.—Stainton, W., St. Pancras, London, "Improvements in the means of preventing evaporation and the formation of ice in wet gas-meters and other apparatus where water or other liquid is used, which it is necessary to prevent from evaporating or freezing, such improvements being also applicable to the purposes of refrigerating and freezing." Jan. 29, 1879.

### PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1057.—Malfroy, A., "A new water-meter, applicable also for measuring other liquids." March 11, 1876.

1074.—Saville, G. E., "An improved gas scrubber or washer." March 11, 1876.

1223.—Porter, G., jun., "Improvements in glass, opal, and other shades and reflectors, and method of supporting and affixing them on to gas and oil burners." March 22, 1876.

1256.—Lake, W. R., "Improved combustible compounds and apparatus for the production of gas for domestic, manufacturing, military, and other purposes." March 24, 1876.

1264.—Lawrence, P., "Improvements in gas and other stoves." March 24, 1876.

1302.—Carpenter, W. T., "Improvements in apparatus used in the manufacture of gas." March 27, 1876.

### PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

99.—Andrews, W. W., "Improvements in wet gas-meters." Jan. 12, 1872.

121.—Lake, W. R., "Improvements in pipes and pipe-joints for gas, water, and other fluids." Jan. 15, 1872.

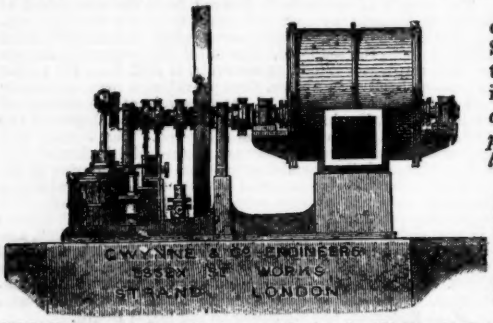
379.—Prange, F. G., and Whitthread, W., "Improvements in the utilization of sewage." Feb. 6, 1872.

730.—Patterson, R. H., "Improvements in the purification of coal gas." March 9, 1872.

738.—Wigner, G. W., and Williamson, J., "Improved mechanism applicable to dry closets and commodes." March 11, 1872.

**The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.**

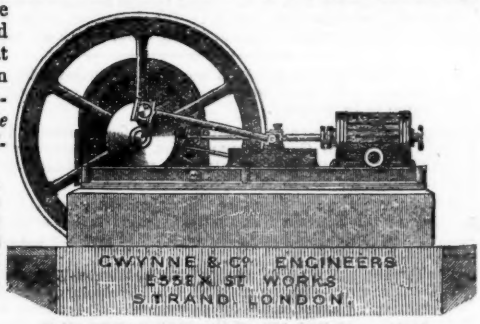
# GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.




EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.




52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

**Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.**

**PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

*Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.*

# TO GAS ENGINEERS.

## D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

**TAY WORKS, BONNINGTON, EDINBURGH.**

**WANTED, Readers of the NEW Edition,** 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, A.I.C.E., Gas-Works, SYDENHAM, S.E.

**WANTED, a Leading Stoker, used to** Scoop Work. Wages 30s. per week. To a steady man, constant employment can be given.
Apply to the MANAGER, Gas-Works, WINCHESTER.

BRECON GAS COMPANY.

**WANTED to Purchase, a Second-hand** GOVERNOR, with 10-in. or 12-in. Connections and Valves complete.
Apply to EDWIN A. WRIGHT, Secretary.

**WANTED, by a respectable Young** Man, aged 27, an Appointment as METER INSPECTOR, COLLECTOR, or to assist the Manager of Gas-Works. Is a good writer, and could assist in the office work. Has a thorough practical knowledge of the Gas-fitting Department, and is also experienced in Superintending Workmen. Excellent testimonials.
Address No. 538, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND ENGINEERS.

**WANTED, by a man in the prime of** life, who has had many years practical experience in the Erection and Management of Gas-Works, and who has recently returned from a foreign engagement, a Situation in a like capacity, either at home or abroad. Unexceptionable testimonials, and security to any reasonable amount for the due performance of all duties in connection with the office. If deemed advisable, would take an interest in any Gas Undertaking, by investing capital in same.
Address, in the first instance, No. 537, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LEIGHTON BUZZARD GAS AND COKE COMPANY.

**WANTED, by the 30th of June next,** a GENERAL MANAGER, thoroughly acquainted with the Engineering in connection with the Manufacture of Gas upon the most improved principles.
Applications, stating age, married or single, experience, and salary required, accompanied by testimonials of recent date, not exceeding four in number, to be forwarded to me on or before the 1st of May next, endorsed "Application for Manager."
The person elected Manager will be provided with a house and garden.

By order,
HIRAM HEARD, Secretary.
Leighton Buzzard, April 5, 1879.

**TRAVELLER wanted, for London and** South District, to represent an old-established Gas-Meter Manufacturing firm.
Address No. 542, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**THE undersigned, now Assistant** Manager of the Black Rock Gas-Works, Brighton, will shortly be open to a re-engagement.
Address WM. WRIGHT, Assoc. Inst. C.E., 2, Princes Terrace, Kemp Town, BRIGHTON.

TO SULPHATE OF AMMONIA MANUFACTURERS.

**A Man of 13 years experience in above** is open to an engagement as MANAGER, or FOREMAN and MANAGER. Understands Book-keeping and general office work.
Address No. 543, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**A Gentleman, well known to the whole** of the gas world, is desirous to become the AGENT for a few firms of high repute for the Sale of Bricks, Retorts, Mains, Wrought-Iron Pipes and Fittings, Materials, and Apparatus required by Gas Companies. A sum per year will be required for expenses of an office in London, and also a percentage on business done.
Address No. 540, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.
[All communications will be held as confidential.]

**TO BE SOLD, Cheap, Three Telescopic** GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND CO., Spring Hill, BIRMINGHAM.

TO GAS MANAGERS.

**THE Directors of the Eastbourne Gas** Company are prepared to receive APPLICATIONS for the post of MANAGER of their Works. Salary £250 per annum, with a house, coals, and gas.
Applications, with testimonials, to be sent in not later than the 21st of April, addressed to Mr. J. H. CAMPION COLES, Gas Company's Offices, EASTBOURNE, and endorsed "Application for Managership."
Any applicant canvassing the Directors will be disqualified.

GAS PLANT FOR SALE.

**THE whole of the Plant of a small Gas-** Works, suitable for a large country residence or mill. It consists of Retort, Fittings, Condenser, Purifier, and Gasholder. The whole of the apparatus is in first-class condition, most of it being quite new.
Further particulars may be obtained from Mr. CARR, Manager, Gas-Works, HALIFAX, or from Messrs. J. CALVERT AND SONS, Illingworth Mills, HALIFAX.

STATION-METER AND HYDRAULIC MAIN FOR SALE.

**THE Bo'ness Gas Company offer for Sale** a STATION-METER, made by James Milne and Son, Edinburgh. Capacity, 2000 cubic feet per hour, 4-in. Connections (replaced with a larger one).
Also 18½ feet of Hydraulic Main, 18 in. by 18 in., D shape, with planed joints, and seven 5-in Dip-Pipes, set for a two-three-two bench of retorts.
Apply to J. R. AMBROSE, Gas Manager, Bo'NESS, N.B.

TO TAR DISTILLERS.

**THE Directors of the Prescot Gas Com-** pany are prepared to receive TENDERS for the TAR and AMMONIACAL LIQUOR produced at their Works for One year, from the 1st day of May next.
Tenders to be sent in not later than Saturday, the 19th inst.
The Directors do not bind themselves to accept the highest or any tender. WILLIAM PRESCOTT, Manager.
Prescot Gas-Works, April 9, 1879.

STOKE CORPORATION AND FENTON LOCAL BOARD GAS-WORKS, STOKE-UPON-TRENT.

**THE Joint Gas Committee are prepared** to receive TENDERS for the construction, on the above works, of one Square PURIFIER, 20 ft. square by 5 ft. 2 in. deep, to be completed with all the necessary connections.
Drawings and specifications can be seen on application to the undersigned, at the Offices, Wharf Street.
Tenders to be sent in, addressed to the undersigned, on or before the 29th of April, endorsed "Tender for Purifier."
The Committee do not bind themselves to accept the lowest or any tender.
JOHN M'MILLAN, Engineer and Secretary.
Gas Office, Wharf Street, April 10, 1879.

TO MANUFACTURING CHEMISTS AND OTHERS.

**THE Directors of the Staines and Egham** Gas and Coke Company, Limited, are prepared to receive TENDERS for the purchase of the whole of the AMMONIACAL LIQUOR produced at their Works at Egham, for a term of One, Two, or Three years (at the option of the Directors), commencing from the 1st of June next. The pumping will be done by the Company's machinery.
Further information may be obtained of the Manager, at the Works.
Sealed tenders, marked "Tender for Liquor," to be sent to the Secretary, on or before the 29th of April inst.
JOHN ANTHONY ENGALL, Solicitor and Secretary.
Staines, April 12, 1879.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

**THE Directors of this Company invite** TENDERS for the Supply of 3000 Tons of New Pelton GAS COAL, to be delivered at the Company's Works, situate on the southern bank of the Thames, in the Parish of Egham, and outside the City coal dues boundary. The coals to be delivered as follows:—400 tons in each of the months of October, November, December, and January next; 300 tons in each of the two following months of February and March; and the remainder as ordered before Sept. 30, 1880.
The tenders to state the price per ton for cash for each month's delivery, and for credit for three months.
The Directors will not accept any conditional tender, nor necessarily the lowest or any tender.
The tenders to be forwarded to me on or before the 29th of April inst., sealed and marked "Tender for Coals."
JOHN ANTHONY ENGALL, Solicitor and Secretary.
Staines, April 12, 1879.

**THE Prescot Gas Company have for Sale,** and which will be sold cheap, a quantity of GAS PLANT suitable for a small Gas-Works, consisting of Hydraulic Main, Mouthpieces, Ascension-Pipes, 6-in. Condensers and Washer.
Further information may be obtained from WILLIAM PRESCOTT, Manager, Gas-Works, Prescot, LANCASHIRE.

TO MAIN LAYERS.

**THE Sevenoaks Gas Company invite** TENDERS for Laying a quantity of 12-in., 10-in., and 6-in. MAINS; also for Taking up and Re-laying other Mains and Services.
Lithographed specification, and conditions of the work required to be done, may be obtained (price 2s. 6d.) at the Office of the Company's Engineer, Mr. Alfred Penny, 20, Abingdon Street, Westminster, and at the Office of the Company, Sevenoaks.
Tenders to be sent addressed to EDWYN CRONK, Esq., Chairman to the Company, not later than the 29th inst.
April 15, 1879.

BELFAST CORPORATION GAS-WORKS.

**THE Gas Committee are prepared to** receive TENDERS for the Supply and Erection of Two Sets (four boxes each) of PURIFIERS, 20 ft. square by 5 ft. deep, with 36-in. Lutes; together with the necessary Columns and Girders to support overhead Stage for lifting covers.
Drawings and specification may be seen at the Offices, Gas-Works, Ormean Road, on and after the 17th inst.
Tenders, endorsed "Tender for Purifiers," must be sent to me not later than the 30th inst.
The Committee do not bind themselves to accept the lowest or any tender. By order,
JAMES STELFOX, Engineer and Manager.

**THE Great Malvern Local Board invite** TENDERS for the Supply and Erection of a Set of Four PURIFIERS, 10 ft. by 10 ft., with Centre-Valve, Condenser, Scrubber, and Gasholder.
Further particulars may be obtained, and drawings and specification examined, in the Office of Mr. J. E. Palmer, Surveyor and Gas Manager to the Local Board.
Tenders to be sent, under cover, addressed to the Gas Committee of the Malvern Local Board, and delivered at the Office of the Board on or before Saturday, the 26th of April inst.
The Board do not pledge themselves to accept the lowest or any tender. By order,
J. H. WHATLEY, Clerk to the Board.
Local Board Office, Malvern, April 10, 1879.

TO CONTRACTORS.

**THE Directors of the Holyhead Gas** Company are desirous of receiving TENDERS for the following EXTENSIONS:—
Two Annular Condensers.
One Circular Cast-Iron Scrubber.
Two Dry Lime Purifiers.
Roof for Retort-House.
Engine and Exhauster with Boiler complete; together with all requisite mains, &c., required.
Plans and specifications can be seen with the undersigned.
The Directors do not bind themselves to accept the lowest or any tender.
Tenders to be sent in to me on or before Wednesday, April 30. EDWIN W. JONES, Manager.
Gas-Works, Holyhead, April 10, 1879.

**LEEDS CORPORATION.**
TOWN HALL.
GAS STOVES, ETC.
**AN EXHIBITION OF GAS APPARATA,**
For the ECONOMICAL USE of GAS for DOMESTIC and MANUFACTURING PURPOSES,
in the
VICTORIA HALL and CRYPT,
Will be
OPENED ON MONDAY, APRIL 21, at Twelve o'clock,
by
HIS WORSHIP THE MAYOR OF LEEDS
(Alderman Addyman),
And continue until Saturday, May 3.
Hours—11 a.m. till 10 p.m.

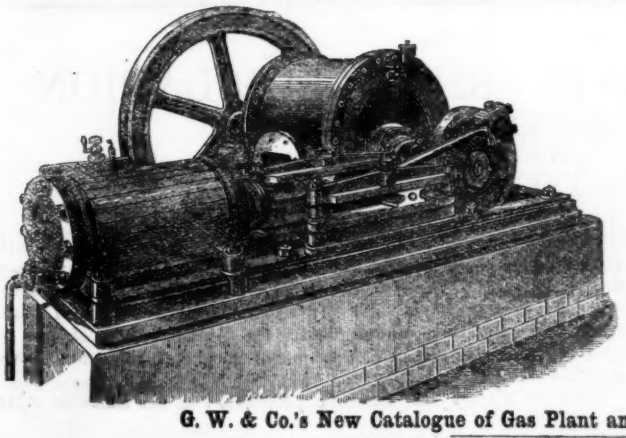
TABLE D'HOTE, 2s. 6d., daily from Twelve till Three.
(All meats cooked by the Apparatus on view.)

Admission:—Mondays, till 6 p.m., One Shilling; Evening, Sixpence. Other days, Sixpence and Threepence. SEASON TICKETS (not transferable) 2s. 6d., to be had at the Gas Offices, Boar Lane, and of Mr. BERRY, at the Town Hall.

# BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

## Wrought-Iron Spindles and ENGINES COMBINED.



SOLE MAKERS,

**GEORGE WALLER & CO.**

**MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.**

**G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.**

Phœnix Engineering Works:
HOLLAND STREET, SOUTHWARK, S.E.

SULPHATE OF AMMONIA APPARATUS.

**I am now prepared to Supply Plans of** this New and Improved System for Making Sulphate of Ammonia. For terms, &c., address as below. I have constructed a small apparatus (glass) which shows the principle and illustrates the working of the larger plant admirably. I guarantee this apparatus to give a first-class result in sulphate if worked according to my instructions, &c. Price of small apparatus, c.o.d., £1 1s.

Address JOHN G. HARVEY, 31, Old Georges Street, CORK.

TO CONTRACTORS.

**THE Gloucester Gas Company invite** TENDERS for a Brick GASHOLDER-TANK 142 ft. in diameter and 35 ft. deep, to be erected at their new Works, Hempsted.

Drawings and specification can be seen, and forms of tender obtained, on application at the new Gas-Works, Hempsted, on and after the 15th inst.

Tenders must be sent in to me, and marked "Tender for Tank," on or before Tuesday, the 29th inst.

The Directors do not bind themselves to accept the lowest or any tender.

R. MORLAND, Engineer and Manager.

Gas-Works, Gloucester, April 3, 1879.

TO CONTRACTORS.

**THE Directors of the Exeter Gaslight** and Coke Company are prepared to receive TENDERS for—

1. Ironwork for Six Settings of Retorts.
2. Connections on Works.

Drawings to be seen, and copies of quantities obtained, on application to Mr. S. E. Stevenson, at the Basin Gas-Works; and sealed tenders, marked "Tender for Iron-work," to be sent to me, the undersigned, on or before Saturday, the 26th inst.

The Directors do not pledge themselves to accept the lowest or any tender.

W. A. PADFIELD, Secretary.

Gas Offices, Exeter, April 1, 1879.

GAS-WORKS FOR SALE.

**THE Trustees of the Estate of Edward** William Cradock Middleton are prepared to receive OFFERS for the Wymeswold (Leicestershire) Gas-Works. The premises are freehold, and consist of a Retort-House, with a Bench of Two and a Setting of One Retort, Coal Store, a comfortable Foreman's House, Meter House, and Store Shed; together with Retort Fittings, Condenser, Scrubber, two Purifiers, Meter Governor and Gasholder (to contain about 3000 cubic feet).

The mains throughout the village are included in the sale. The streets are lighted by 26 public lamps. The Works are of recent date, in very good condition, and are well situated. The gas and meter rental amounts to over £200 per annum, and the consumers are steadily on the increase.

Further particulars may be obtained of Messrs. DEANE AND HANDS, Solicitors, Market Place, LOUGHBOROUGH.

GAS COAL.

**THE MIRFIELD COAL COMPANY** are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67 *candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON

**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash and when Cannel of the best description is scarce, it may well replace this material."

**THE Hampton Court Gas Company have** FOR SALE, One 40 ft. by 16 ft. GASHOLDER, with six Cast Columns and Wrought Girders, to be Sold very cheap, as the position is wanted.

Also the following PLANT, the whole of which is in excellent condition, having been removed for larger:—

One 8-horse Power Vertical Engine.
One 20,000 ft. Beale's Exhauster.
One 15,000 do. do.
Two Beale's Slide-Valves.
Two Waller's Disc-Valves.
One 8-in. Bye-Pass Valve.
One 20-in. diameter Exhaust Governor.
Three Riggers.
One 3-in. Cast-Iron Pump, Fowler's make.
One 2-in. do. do.
Driving Gear for the two Pumps.
One 3-in. Brass Valve Pump, with Driving Gear.
One Cast-Iron Scrubber, 12 ft. high by 5 ft. 6 in. diameter, with 8-in. connections.
Three 8-in. Donkin's Valves, 8-in. Pipes, Bends, &c., for connections.
Two Small Washers and Connections.

For further information, apply to Mr. E. PRICE, Engineer and Manager, Gas-Works, HAMPTON WICK.

**WILLIAM HAILES,**
**Builder and Contractor**
FOR THE ERECTION AND RESETTING OF RETORT-BENCHES.

**Fire Goods and Iron Work Supplied.**

Hailes's Improved Retort Settings guaranteed to produce the greatest amount of heat with a small per cent. of Fuel.

**Plans and Specifications Prepared.**

**Address: 122, Westfield Street, St. Helen's, Lancashire, and 3, High Street, Brentford, Middlesex.**

PATENT

MACHINE-MADE RETORTS.

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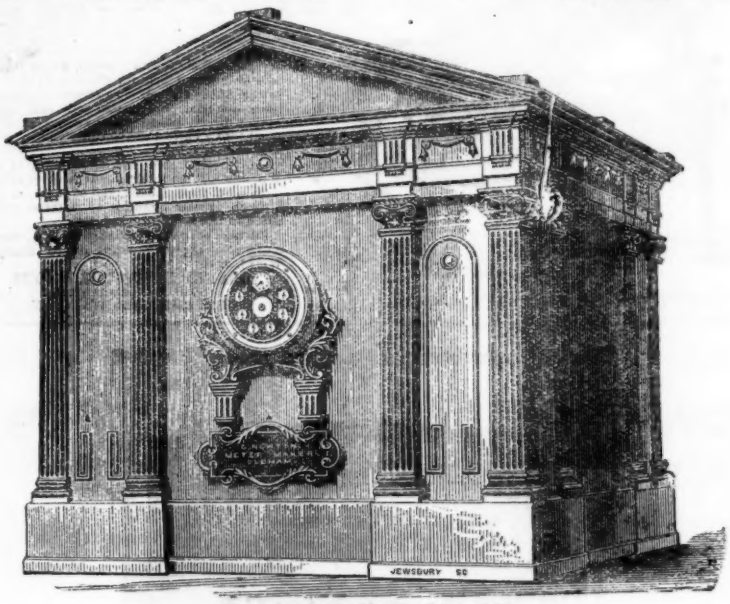

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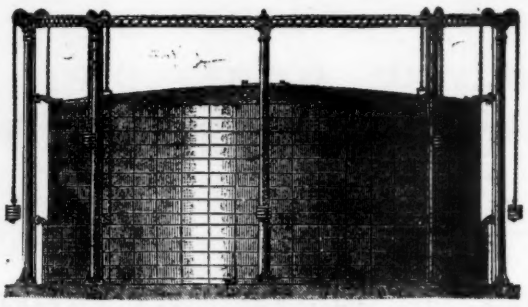

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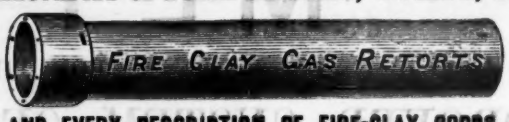


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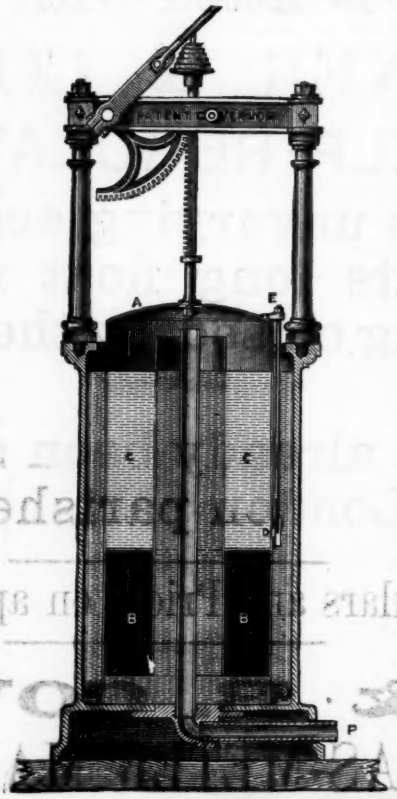


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The illustration represents a section of the Patent Governor. The lower part of the Bell A is fitted with a loose Float B, and in the upper part of the Bell is a deep annular Water Chamber C, at the bottom of which is an opening D, with a slide outside regulated by a Screw Spindle E, to allow the water to pass in and out of the Chamber C quickly or slowly, according to circumstances, but when once adjusted the slide does **not require altering.** This Self-compensating Chamber gives great steadiness to the up and down movement of the Bell and effectively prevents the "hunting" motion so common with other Governors, thereby ensuring a more perfect action on the throttle-valve of the Engine **than attained by any other.** The sketch shows the clip lever fixed to work on throttle-valve at an angle, and can work in either direction. P is the Gas Inlet-pipe to Governor.

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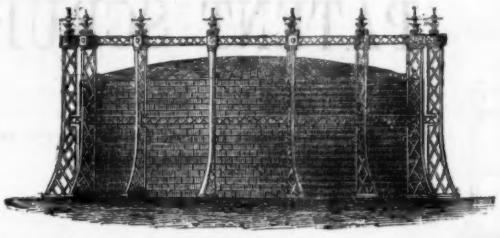

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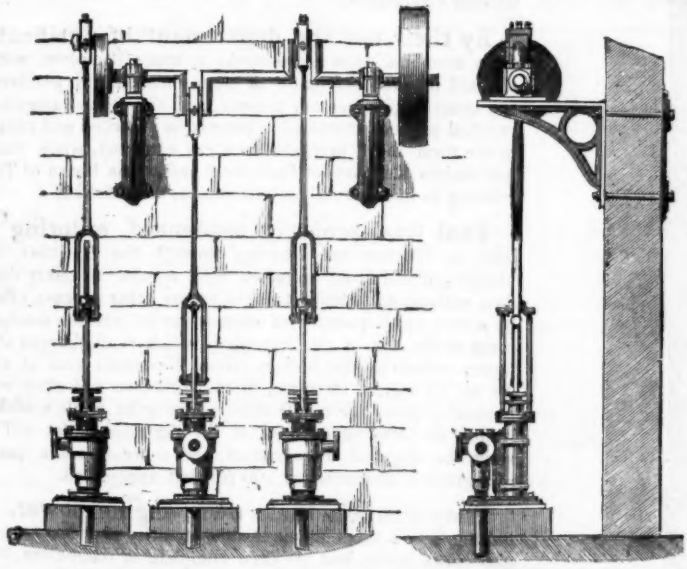

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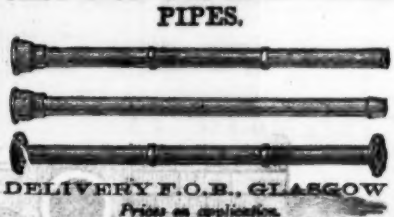

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By Letters Patent in Great Britain, Europe, and the United States of America.

**By some important improvements recently** patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

**It is to be particularly noted that the** important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom *to top*.

**Fifty million cubic feet of gas per 24 hours** are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

**Generally, wherever a high standard of** purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

**By their use the department of purification** from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

**Foul Gas, properly condensed, entering the** inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

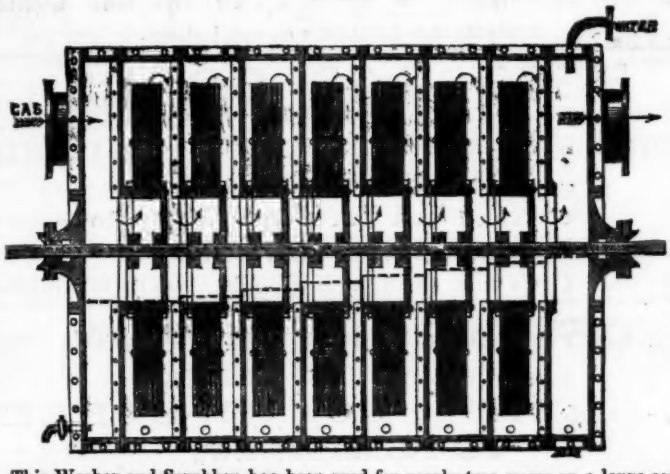
**They contain their own engine power,** requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

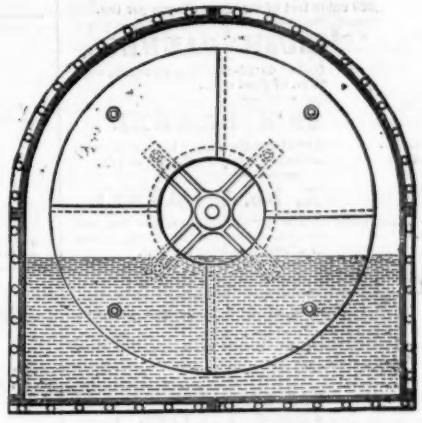
**Applications relating to dimensions and** prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

# "STANDARD" WASHER & SCRUBBER.

## [KIRKHAM, HULETT, AND CHANDLER'S PATENT.]



This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective.

That the distribution of the liquor is made with unerring regularity.

That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather.

That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided.

That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas.

That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

That it is much cheaper than any other Scrubber that will do the same amount of work effectually.

That it is the only Washer suitable for purifying Gas from all its impurities by solution.

That it works with a minimum of pressure.

That it takes out every trace of Ammonia from the Gas in once traversing the machine.

That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

(Copy.) *The Gaslight and Coke Company*
*Bromley-by-Bow, May* 3, 1877.

D. HULETT, Esq.

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

(Copy.) *The Leeds Corporation Gas-Works,*
*York Street, Leeds, Dec.* 6, 1878.

MESSRS. KIRKHAM, HULETT, and CHANDLER.

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber**, so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel**. The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

(Copy.) *The Gaslight and Coke Company.*
*York Road, King's Cross, Jan.* 14, 1879.

MESSRS. KIRKHAM, HULETT, and CHANDLER.

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia**, while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.

I remain, Gentlemen, yours truly, (Signed) JOHN CLARK.

*The following Table shows the results of the working of one of these Washers, lately erected to purify* 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

| 1879. | Nos. of the Divisions and Strength of Liquor in each. | | | | | | | | | | Water used per Ton of Coals. | Gas Purified per Hour, Cubic Feet. | Ammonia on Outlet. | Temperature. | | | Pressures. | | Revolutions per Minute. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | Inlet. | Outlet. | Atmosphere. | Inlet, Inches. | Outlet, Inches. | |
| | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | | | | | | | | | |
| January 1 | 8½ | 6½ | 5 | 3½ | 2½ | 1½ | ¾ | ¼ | 0 | 0 | 10 Gallons. | 52,000 | Nil. | 77° | 73° | 48° | 24 | 23 | 7½ |
| ,, 2 | 8¾ | 7 | 6 | 4½ | 3½ | 2½ | 1½ | ¾ | ¼ | 0 | 10 ,, | 57,000 | Nil. | 73° | 66° | 32° | 21¾ | 20½ | 4 |
| ,, 3 | 9½ | 8 | 6 | 5¾ | 3 | 2½ | 1½ | ¾ | ¼ | 0 | 10 ,, | 60,000 | Nil. | 75° | 68° | 40° | 23½ | 22 | 4 |
| ,, 4 | 9½ | 7¾ | 6½ | 4½ | 3½ | 2½ | 1½ | ¾ | ¼ | 0 | 10 ,, | 65,000 | Nil. | 74° | 68° | 33° | 24 | 22½ | 5 |
| ,, 5 | 9½ | 7 | 6 | 4 | 3 | 2½ | 1½ | 1 | ¾ | 0 | 10 ,, | 34,000 | Nil. | 77° | 68° | 35° | 14½ | 14 | 5 |
| ,, 6 | 9¾ | 7½ | 6½ | 4½ | 3 | 2½ | 1½ | 1 | ¼ | 0 | 10 ,, | 63,000 | Nil. | 72° | 66° | 27° | 24 | 22½ | 4½ |
| ,, 7 | 11 | 9 | 7 | 5½ | 3½ | 3 | 1½ | 1½ | ¾ | 0 | 10 ,, | 59,000 | Nil. | 74° | 66° | 31° | 25 | 23½ | 5 |
| ,, 8 | 9½ | 7½ | 6 | 4½ | 3 | 2 | 1 | ¾ | ¼ | 0 | 10 ,, | 78,000 | Nil. | 73° | 61° | 31° | 28 | 26½ | 4½ |
| ,, 9 | 11 | 9 | 7 | 5 | 3½ | 2½ | 1½ | 1 | ¾ | 0 | 10 ,, | 82,000 | Nil. | 74° | 67° | 33° | 27½ | 25½ | 5 |
| ,, 10 | 10¾ | 8½ | 6½ | 5 | 3½ | 2½ | 1½ | 1 | ¾ | 0 | 10 ,, | 68,000 | Nil. | 76° | 64° | 28° | 28½ | 27 | 5 |
| ,, 11 | 12½ | 10 | 7¾ | 5¾ | 4½ | 3½ | 1¾ | 1¼ | ¾ | 0 | 10 ,, | 61,000 | Nil. | 73° | 64° | 27° | 26½ | 25¼ | 5 |
| ,, 12 | 11 | 8¾ | 6¾ | — | — | 1¼ | ¾ | ¼ | ¼ | 0 | 10 ,, | 39,000 | Nil. | 74° | 64° | 27° | 26¼ | 25½ | 5 |
| ,, 13 | 13 | 10½ | 8¼ | 6 | 4¾ | 3½ | 2 | 1½ | ¾ | 0 | 10 ,, | 78,000 | Nil. | 73° | 63° | 42° | 28 | 26 | 5 |

(Signed) JOHN CLARK, Engineer.

For further particulars and testimonials, address

**Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.**

## ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

### SHOTT'S BOGHEAD.

### HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

### THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

### LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

### MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

### OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from Wedderspoon, Ferguson and Co., 21, Lime Street, London, E.C.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to Pope and Pearson, Limited, West Riding and Silkstone Collieries, near Leeds.

## HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,594 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9865 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. Richardson, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

## HOLMSIDE GAS COALS.

*South Metropolitan Gaslight and Coke Company,*
*589, Old Kent Road, London, S.E.,*
*Oct.* 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

George Livesey, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

George Livesey.

We are this year, 1878, using 80,000 tons of Holmside Coal.

George Livesey.

FITTING OFFICE:

Address, 75, QUAYSIDE, NEWCASTLE-ON-TYNE.

## M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. Bennett, 22, Great George Street, Westminster, S.W., or to M. Bremond, Gas Engineer, Compania Madrileña de Alumbrado y Calefaccion por Gas, Madrid, who may be consulted upon all matters connected with the Gas Industry.

## FERRAND DAVIES,

148 GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

## BEST GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

## GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

## J. & J. BRADDOCK,

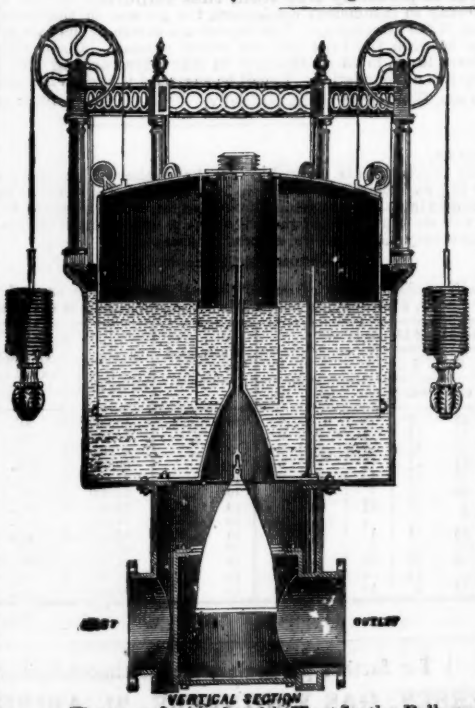
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

## PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

# THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

**DODWORTH, BARNSLEY.**

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

## REAL OLD SILKSTONE GAS COAL.

**JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—**

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

**PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.**

## SULPHATE AMMONIA.

## R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

**PARIS EXHIBITION,**
**1878.**

## THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

## JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

**SILVER MEDAL**

FOR THEIR

**PATENT MACHINE-MADE**
**RETORTS AND FIRE-BRICKS,**
Being the Highest Honour given for this class.

Established

**1795.**

## JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

**NEAR LEEDS,**

**London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.**

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

# NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

## CELEBRATED SILKSTONE GAS COALS.

**The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.**

**A recent extensive development of the Collieries enables us to offer increased supplies.**

**JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—**

*"Warrington Gaslight and Coke Company,*
*Offices, Mersey Street, Warrington, April 23, 1877.*

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

**Full particulars will be sent on application to us—address as above.**

# CROLL'S
# DRY GAS-METERS,

PRIZE MEDALS. LONDON, 1851; NEW YORK, 1853 PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS. LONDON 1862; DUBLIN, 1865; PARIS, 1867

**THE GAS-METER COMPANY, LIMITED,**

238, KINGSLAND ROAD, LONDON, N.E.

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## ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

## "WET" AND "DRY" GAS-METERS,

**STATION-METERS, AND GOVERNORS.**

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

TESTING APPARATUS for all purposes relating to Gas, &c.

MR. VERNON HARCOURT'S COLOUR TESTS,

Descriptive particulars, per post, 2d.

**55, 55a, & 56, MILLBANK STREET, WESTMINSTER, LONDON, S.W.**

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## R. LAIDLAW AND SON,

**EDINBURGH** AND **GLASGOW.**

*Manufacturers of*

**CONSUMERS IMPROVED WET GAS-METERS,**

THE UNVARYING WATER-LINE GAS-METERS,

**IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;**

**STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;**

**Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.**

LONDON OFFICE:

**6, LITTLE BUSH LANE, CANNON STREET, E.C.**

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# IMPROVED HYDRAULIC CRANES,

**Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.**

**DIRECT-ACTING HOISTS**

For LIFTING RAILWAY WAGGONS to RETORT-HOUSE STAGEWAY; CAPSTANS for HAULING WAGGONS, &c.,

**HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.**

**Sixteen recently erected at Beckton, applied to Covers 30 feet square.**

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

**SULPHATE OF AMMONIA APPARATUS,**

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY.

**For particulars, apply to**

## JOHN ABBOT & CO., LIMITED,

**2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.**


London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 15, 1879.